WESTERN GAS

January 1928

20 Cents the Copy

JADE GREEN

MANDARIN RED

ESTATE GAS RANGES IN GAY COLORS

. . . for this modern, colorful age

COLOR!—color everywhere! Colorful motor cars and clothes, homes and furniture, walls and floors. The age of youth and brightness.

Color! Even the kitchen has felt its magic touch. The timid whites and doleful grays are passing into yesterday. Today's kitchens must be gay, sunny, smiling. And Estate Gas Ranges, gaily decorated in motifs of Jade Green, Mandarin Red, and King's Blue, will be the center of the picture.

Colorful ranges! The first new note in gas ranges in a decade. What woman could resist them?

Write or wire. We will immediately send you information regarding these ranges in today's new colors, and details of the most unusual and dramatic merchandising plan that will insure the sale of many additional ranges.

THE ESTATE STOVE COMPANY, HAMILTON, OHIO

San Francisco
180 New Montgomery St.

KING'S BLUE

Portland, Ore.
Terminal Sales Building

Fresh-Air Oven

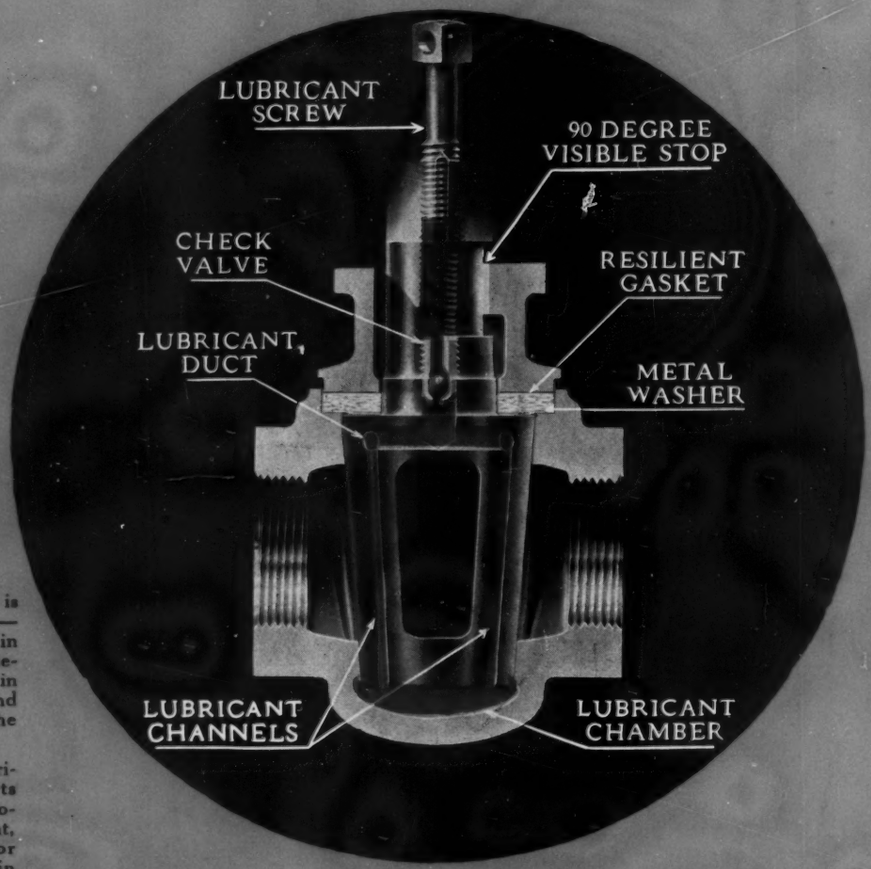
JAN 15 1928

A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

PRINT IN BINDING

TP700
.P3

The Valve that *outlasts!*



—and it won't leak

A valve that is not lubricated is subjected to excessive wear—and the longer the valve is in service the more pronounced becomes the wear—resulting in leaks and consequent losses and danger plus depreciation of the valve itself.

But Nordstrom Valves are lubricated under pressure. The parts where wear is imposed are protected at all times by lubricant, so that leaks will not occur,, nor can any substance carried within the line intrude and cause cutting,corrosion or other deterioration.

And so the Nordstrom Valve outlasts many of the ordinary type and is therefore most economical in installation cost—to say nothing of the savings made in the operator's time and the increased efficiency of the plant.

May we send our descriptive catalog?

MERCO NORDSTROM VALVE CO.

SUBSIDIARY OF THE MERRILL COMPANY

Engineers—

San Francisco, 121 Second St.
Chicago, Peoples Gas Building
Cleveland, Ohio, Engineers Building

Manufacturers

New York, 11 W. 42nd St.
Houston, Petroleum Bldg.
New Orleans, Masonic Temple Bldg.

Western Factory: Oakland, California

Eastern Factory: Belleville, New Jersey

AGENCIES IN PRINCIPAL CITIES

MERCO Nordstrom Valve

BCB mar. 7, 1931

BBR Mar. 7, 1931

944
3507

SAVE the waste

Refinery Rundown Tank Losses equal 1.8% storage losses of light products equal 2.5% according to— U. S. Bureau of Mines

The recovery of vapors from Rundown and Storage tanks eliminates waste and is profitable because of the high gravity gasoline content of the vapors.

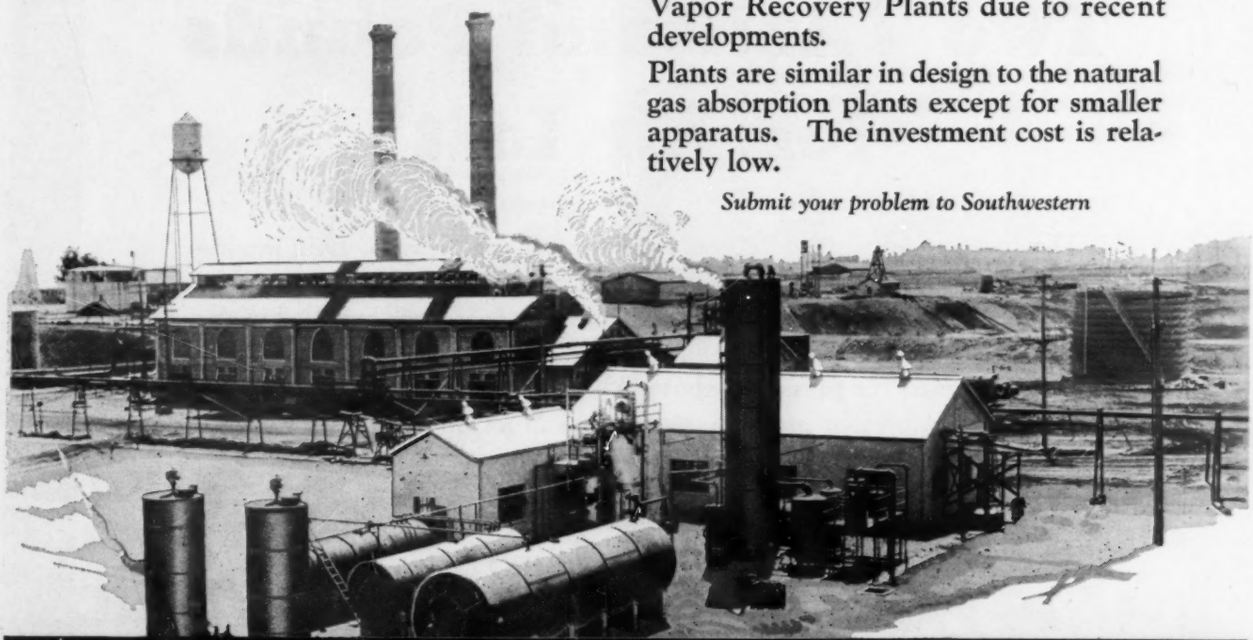
Southwestern Vapor Recovery Plants have proven successful. They pay for themselves in a short time in nearly every case.

In the recovery of refinery vapors, a much more stable gasoline than previously possible, can be produced in Southwestern Vapor Recovery Plants due to recent developments.

Plants are similar in design to the natural gas absorption plants except for smaller apparatus. The investment cost is relatively low.

Submit your problem to Southwestern

Southwestern Vapor Recovery Plant in a California Refinery



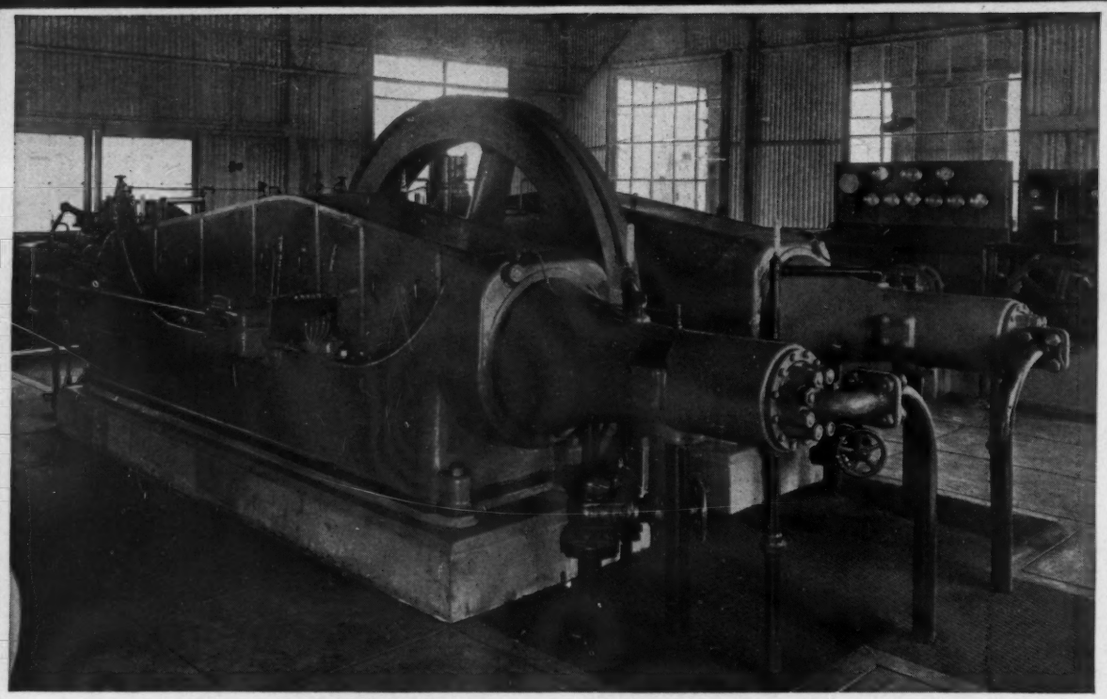
SOUTHWESTERN ENGINEERING CORP.

HOLLINGSWORTH BLDG.
Los Angeles, Calif.

Branch
Joplin National Bank Bldg.
Joplin, Missouri

and
90 WEST STREET, NEW YORK CITY

Branches
Western Bldg., Amarillo, Tex.
Mayo Bldg., Tulsa, Okla.



Two Thousand Pounds for Air Lift

The installation pictured above shows a Cooper Type-80 twin engine equipped with compressors designed for compressing air to 2000 pounds for lifting oil. Two similar units were recently installed in the world's first commercial Helium Plant. Cooper compressors have been designed for pressures above 3500 pounds. If you have a high pressure compressor problem, better consult a Cooper engineer.

THE C. & G. COOPER COMPANY

MT. VERNON, OHIO

1111 Magnolia Bldg., Dallas 604 Kennedy Bldg., Tulsa 649 S. Olive St., Los Angeles

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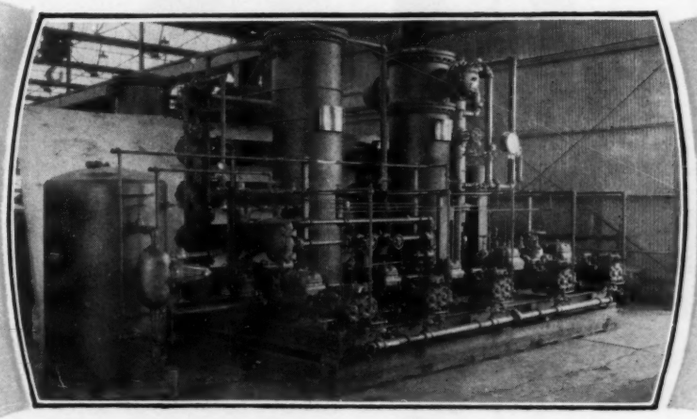
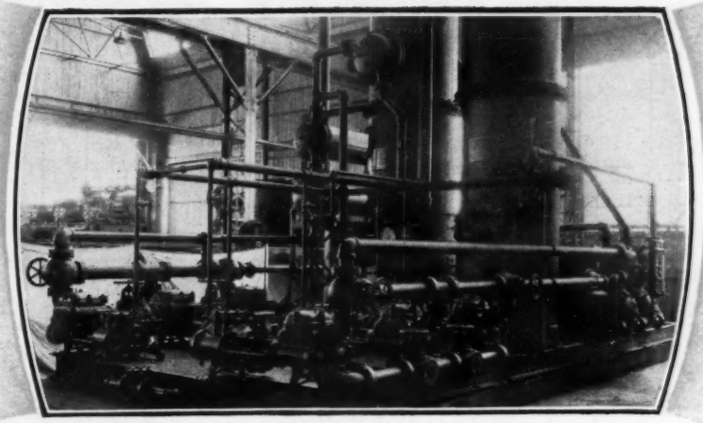
IN STOCK

FOR IMMEDIATE DELIVERY





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PORTABLE • MOBILE ABSORPTION PLANTS

GASOLINE CAPACITIES 3600 TO 30,000 GALLONS PER 24 HOURS

C. F. BRAUN & CO.

MANUFACTURING MECHANICAL ENGINEERS

ALHAMBRA - CALIFORNIA

TULSA DALLAS NEW YORK

In 1928...

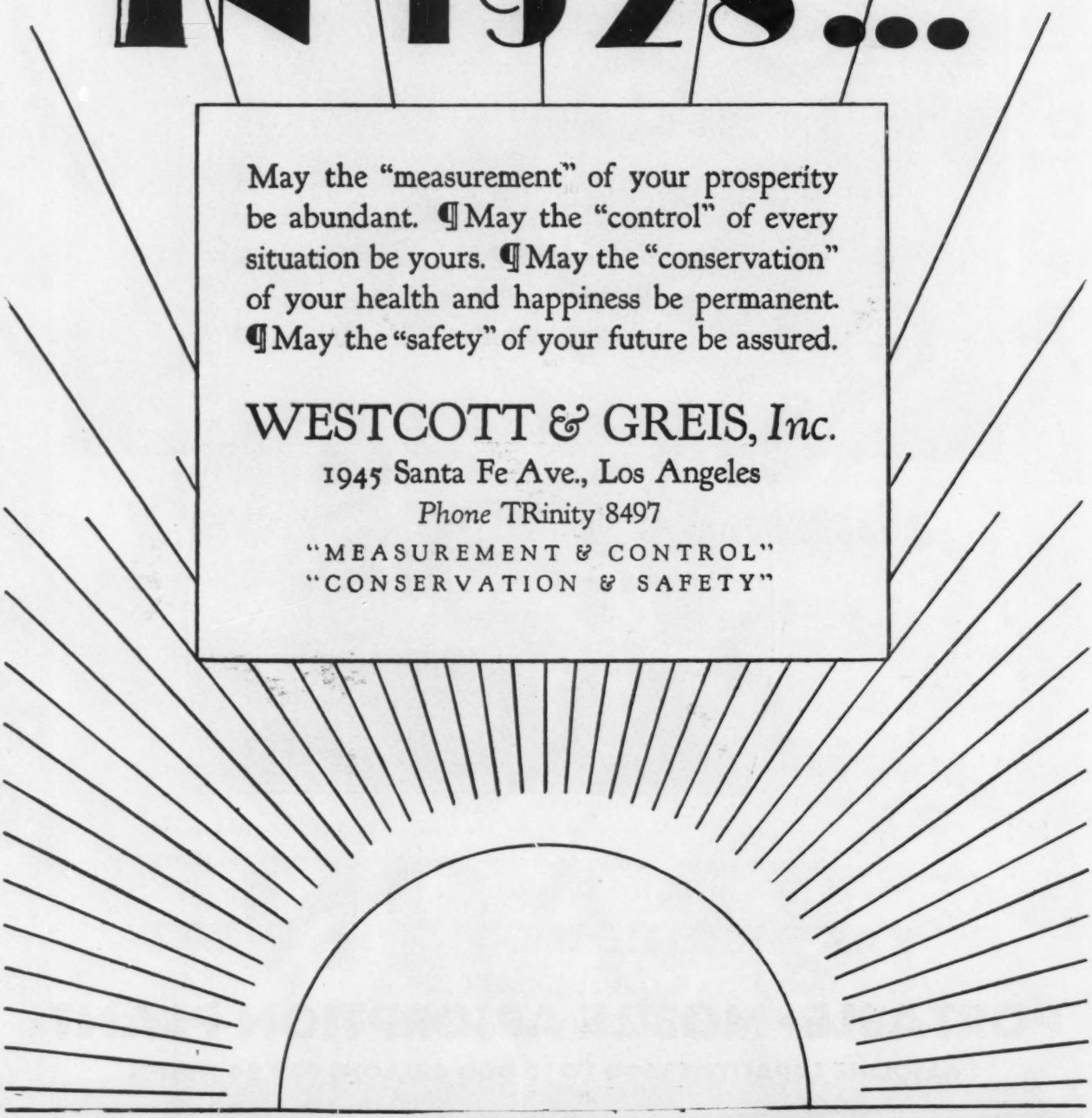
May the "measurement" of your prosperity be abundant. ¶ May the "control" of every situation be yours. ¶ May the "conservation" of your health and happiness be permanent. ¶ May the "safety" of your future be assured.

WESTCOTT & GREIS, *Inc.*

1945 Santa Fe Ave., Los Angeles

Phone TRinity 8497

"MEASUREMENT & CONTROL"
"CONSERVATION & SAFETY"



WESTCOTT & GREIS

LOS ANGELES TULSA DALLAS

MORE PROOF—

conclusive

NINETY DAY PROGRESS REPORT
TESTS OF ELECTROLYSIS RESISTANT PAINT

The samples submitted of "McEverlast Electrolysis Paints" were subjected to the following tests to determine their resistance to electrolysis:

Three specimens of one-half inch pipe were painted with one coat of "Electrolysis Penetration Coat" and two coats of "Electrolysis Cover Coat." Three days were allowed between coats for drying. These three specimens of painted pipe were used as one electrode and a battery carbon as the other electrode in a 5% salt solution as the electrolyte. Current was furnished by three dry cells connected in series. The painted pipe were immersed 3¼ inches in the salt solution. The carbon (⅞ inch in diameter) was immersed 3¼ inches in the salt solution. The distance between electrodes was about 1½ inches. The dry cells were of a capacity of 30 amperes and 2 volts—total potential of 6 volts for the three cells in series.

The test was started September 18th, 1927. On October 24th, thirty-six days after starting the test there had been no passage of current in this time as shown by the discoloration of the solution or the failure of any of the painted test specimens.

The three specimens of painted pipe were then (October 24th, 1927) removed from the salt solution, and the same specimens were further tested by immersing them in moist corrosive soil. As in the test with the salt solution the specimens of painted pipe were used as one electrode and a battery electrode as the other electrode, also the depth of immersion, distance between electrodes, and the potential (6 volts) were the same.

The corrosive soil used was some that was submitted by one of the principal oil companies, September 29th, 1927, from a place from the San Pedro Outer Harbor district where they had experienced much trouble from pipe corrosion.

During the first part of the test in the corrosive soil, water was added from time to time sufficient to keep the soil moist. After November 8th no more water was added. The drying of the soil brought efflorescent salts to the surface. The soil, however, did not fully dry out, but remained somewhat moist, evidently due to its clay-like character and its content of saline materials.

The test specimens were examined from time to time and tests were made with a milliammeter to determine if any current was permitted to pass between the electrodes due to the failure of the electrolysis resistant paint. Observations were taken as follows:

Date	Elapsed Time Since October 24, 1927	Remarks
Nov. 5, 1927	12 days.....	No current passing. Specimens O. K.
Nov. 8, 1927	15 days.....	Slight current passing. One specimen showed slight failure at junction of paint with end plug in pipe. This specimen was removed and test continued with other two specimens of painted pipe.
Nov. 14, 1927	21 days.....	No current passing. Specimens O. K.
Nov. 21, 1927	28 days.....	No current passing. Specimens O. K.
Nov. 28, 1927	35 days.....	No current passing. Specimens O. K.
Dec. 5, 1927	42 days.....	No current passing. Specimens O. K.
Dec. 9, 1927	46 days.....	No current passing. Specimens O. K.
Dec. 17, 1927	54 days.....	
	or 90 days since Sept. 18th when test was first started..	No current passing. Specimens O. K.

Respectfully submitted,

SMITH-EMERY CO.,
Chemists and Engineers.

"McEVERLAST" Pipe Line Coatings stood this 90-day test; probably the most severe test ever applied to a coating—electrolysis from within; strong alkali soil from without.

We will furnish list of large users and convincing literature upon request.

EVERLASTING PAINT AND SALES COMPANY

1110 Board of Trade Bldg.
Los Angeles, Calif.

1217 Magnolia Bldg.
Dallas, Texas

Greetings

A New Year gives to all a new inspiration, new hopes, new determinations to do our tasks better, more worthily, with greater benefits to our industry.

We are grateful for the support rendered this organization, and through this New Year and the years to come, we hope to justify even more fully the splendid confidence that has been shown in us.

With an earnest appreciation of the good will and patronage of our friends and customers, we extend to them sincere good wishes for 1928, and the hope for that wider, deeper prosperity which should ever bless this industry.

Pacific Meter Works

of the
American Meter Company, Inc.
Northwestern Representative

SAN FRANCISCO
495 Eleventh St.

PORTLAND
Northwestern Gas and Electric Equipment Co.

LOS ANGELES
2118 Atlantic St.

EMCO

CURB BOX METERS

It takes an Emco Cast Iron Meter to Stand the Gaff of the Elements

Twenty years of constant exposure to the destructive elements without impairing the efficiency of a gas meter, is the very remarkable record of hundreds of EMCO Curb Box meters throughout the rural districts of the country—a silent but eloquent testimonial of the weather-proof durability of EMCO—the original cast iron meter.

All exposed parts are made of material which will not corrode and in districts where flooding is a constant danger EMCO meters will not be injured by complete submersion.

It pays to install EMCO meters made to stand the gaff of weather and rough usage.

EMCO

Pittsburgh Equitable Meter Company

PITTSBURGH

BRANCH OFFICES:
New York, N. Y. Chicago, Ill. Dallas, Tex.
Los Angeles, Cal. Tulsa, Okla. Seattle, Wash.
Columbia, S. C. Salt Lake City, Utah Kansas City, Mo.

PENNA.

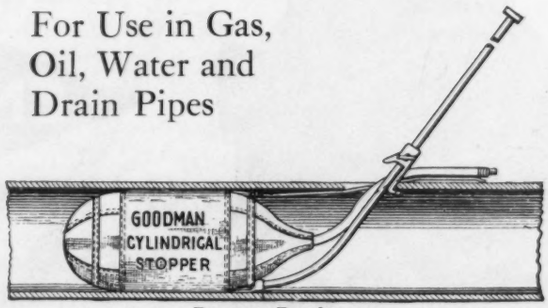
AIR LINE MASK
With or Without
Blower
Mask and Blower
in Separate Cases

Dependable Gas Main Bags--3 Types

Type A—Seamless.
Type B—Reinforced Seams.
Type C—Canvas-Covered for use in mains coated with tar or oil.

Plugs - Main and Service
Pipe Cleaning Brushes
Soap Tape

For Use in Gas,
Oil, Water and
Drain Pipes



Patents Pending

SAFETY GAS MAIN STOPPER CO.

PATRICK GOODMAN, Owner

523 ATLANTIC AVENUE, BROOKLYN, N. Y.

Oklahoma Representative
Circle Corporation
Tulsa, Oklahoma

Pacific Coast Representative
C. B. Babcock Co.
San Francisco, California

Below:
Owosso Plant
Oklahoma Natural
Gas Company

Above:
Interior View of
Owosso Plant
Oklahoma Natural
Gas Company

FOR INDUSTRIAL INTERIORS AND EXTERIORS —BITULUMIN REFLECTS LIGHT —PREVENTS CORROSION

Aluminum Paint Prevents Surface Breakdown from Ultra-Violet Rays— Gives More Light

Correctly made aluminum paints like Bitulumin are largely immune to destructive ultra-violet rays. They will outlast the best oil and zinc paints by two to one.

Bitulumin forms a protective coating of tiny aluminum flakes like shingles held firmly together by its moisture proof liquid vehicle. It is both light proof and weather proof.

Because Bitulumin deflects approximately 86% of sun rays it makes for cooler surfaces and in the case of tanks reduces evaporation.

Bitulumin, although widely used for painting oil storage, is equally efficient on tank cars, metal buildings, refinery equipment, still towers, water tanks, bridges, etc.

Bitulumin, put up in double containers to insure fresh mixing, is manufactured by Hill, Hubbell & Company, manufacturers of a special line of paints and protective coatings for the oil industry.

HILL, HUBBELL & COMPANY

Manufacturers of
Highest Grade Oil Industry Paints and Pipe Line Coatings
Factories at SAN FRANCISCO and TULSA

District Offices:

LOS ANGELES
SEATTLE
HOUSTON
PORTLAND
NEW YORK CITY
BALTIMORE

A radiant gas heater gives clean, quick warmth

Now there's no need of working for your fireplace

To grandmother, warmth meant fuss and trouble. But to mother, clean, healthful heat is instantly available by touching a match to a gas fired radiant heater.

A gas-fired radiant heater in your fireplace costs about one cent and a half an hour to operate.

You can heat a room without warming the whole house.

You bring the warmth and cleanliness of Spring sunshine into your living-room. This banishes chills and keeps the family well.

You instantly get invigorating warmth when you come home from shopping or from the theatre.

Come in and ask us about modern radiant gas heaters. They're not expensive, and the saving in fuel bills soon pays for the heater.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians

201-129

1 million messages about radiant heat

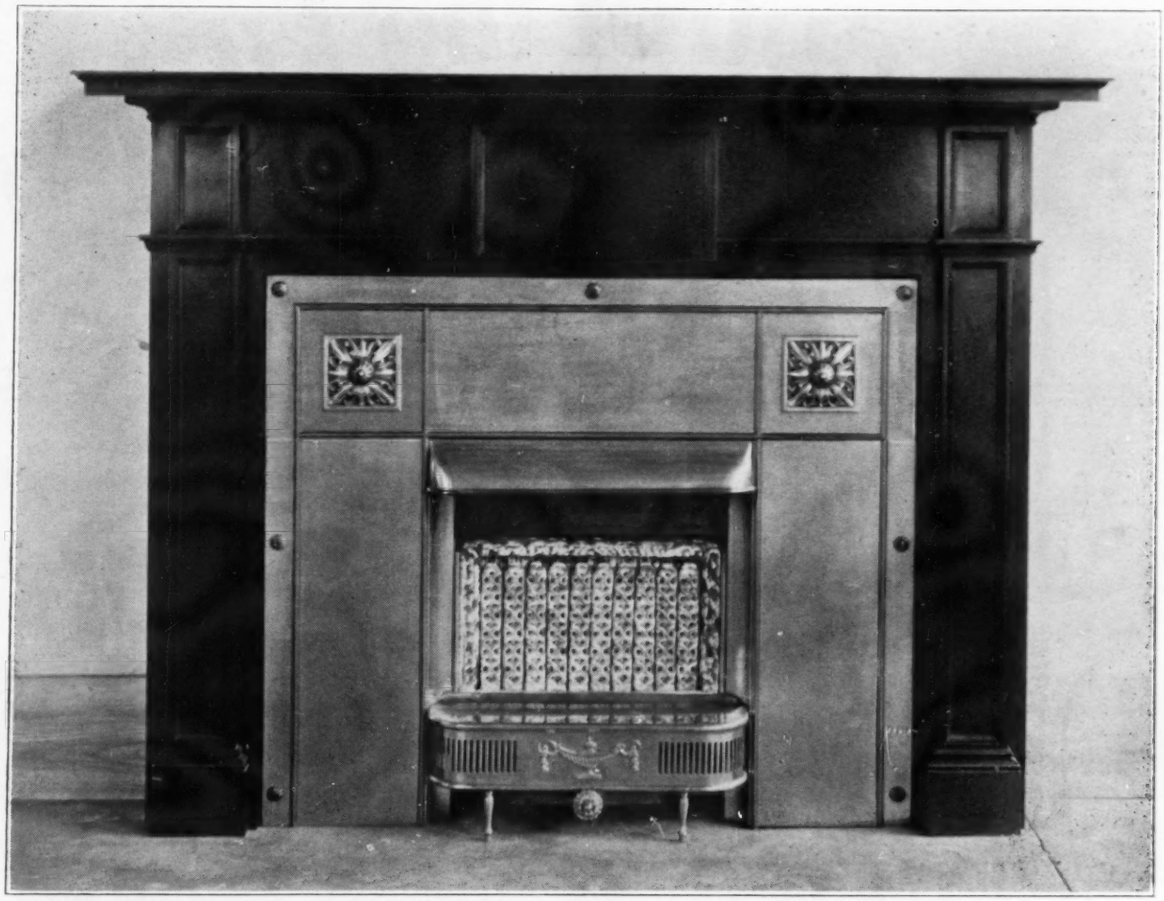
Showing people a better way of using their fireplaces

THE above advertisement is a reproduction of a 3-column 8-inch message about radiant heating. It will have a total newspaper circulation in the Pacific Gas and Electric Company's territory of one million. It's appearing in the papers this month while people are thinking about heat. This advertisement shows the folly of working for a fireplace when clean, convenient radiant heat may be had cheaply from a radiant gas heater.

This is part of our program mapped out this year to help everyone sell good gas appliances.

Tie-in with this sales effort and cash-in on the advertising appearing in 149 newspapers.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians



A New Product With a Wide Market

The cheapest kind of fireplace installation costs more than the new Humphrey Radiantfire-Mantel. Every type of structure in which fireplaces have been omitted heretofore on account of expense, can now have fireplaces with this new Humphrey product. Think of the vast market in homes, apartments, hotels; think of the number of homes alone which will welcome this Humphrey product for an *extra* fireplace at small cost!

The Humphrey Radiantfire-Mantel is of characteristic Humphrey b e a u t y and substantial construction, and comes equipped with a Humphrey Radiantfire unit. Installation is simple and inexpensive.

Prices: No. 500—Finish, 3 coats flat white, list price.....$118.00
No. 501—Finish, mahogany, list price.....$125.00
F.O.B. San Francisco

The HUMPHREY Radiantfire

TRADE MARK REG. U S PAT OFF

Manufactured by
General Gas Light Co.
Kalamazoo, Mich.

Pacific Coast Manager
C. B. Babcock
135 Bluxome St.,
San Francisco

come out of the kitchen

Welsbach

presents a water heater sales idea as modern as the HOTZONE

For years water heater sales promotion has been chained to the kitchen. Manufacturers and gas companies have been equally guilty in making the water heater a boon companion of dirty dishes and soiled linen. But now Welsbach, with a water heater that deserves better associates, leads the parade out of the kitchen. Women are seeing the hot water service of the Hotzone as an important aid to beauty. They are seeing it as a companion of their powder puff, creams and lotions.

Every beauty system preaches the need for warm water at late and early hours. The Welsbach Hotzone steps out of the kitchen into the boudoir where money is spent freely by all classes.

If you want greater water heater sales get acquainted with the greater selling plan of Hotzone. A Welsbach franchise brings with it the key to sales. Write Welsbach Company,

HOTZONE
SELF-ACTING WATER HEATER

San Francisco Office
863-865 Mission Street

Member of American Gas Association
Member of Pacific Gas Association

ALL its top is effective *cooking* surface

(an exclusive SMOOTHTOP feature)

Wide warming shelf . . . . . .

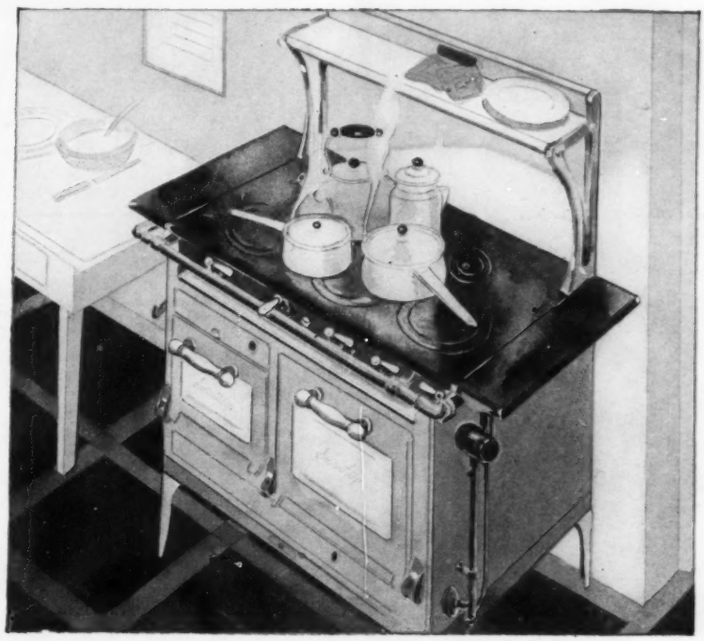
All of Smoothtop is cooking surface

4 kettles can cook on 1 burner . . . .

Pilot light . . . . .

3 heats—boil, simmer, warm . . . .

Smart, modern designs . . . . . .



Convenient height —38" from floor . .

Standard heat control . . . . . .

Well-designed separate broiler . .

Even heat through out large oven . .

Strong-hinged oven doors act as loading shelves . .

Beautiful, durable finish . . . . . .

GAS men tell us they like to sell Smoothtops because it gives them something to talk about. It isn't "just another range."

Take the top—Smoothtop's most obvious improvement over other ranges, including so-called "solid top" ranges. Due to a system of flues, heat is drawn back underneath the top from the front burners giving infinite gradations of heat from quick cooking to warming—all from one burner. ALL the top is effective cooking surface.

Yes, Smoothtop has the best features of conventional ranges plus many exclusively its own. That's what makes it such an interesting range to sell—and why it's so much easier to interest women in it.

Better write us about our merchandising proposition

A STANDARD OF STANDARD GAS EQUIPMENT CORPORATION

Northwest Gas and Electric Equipment Co.

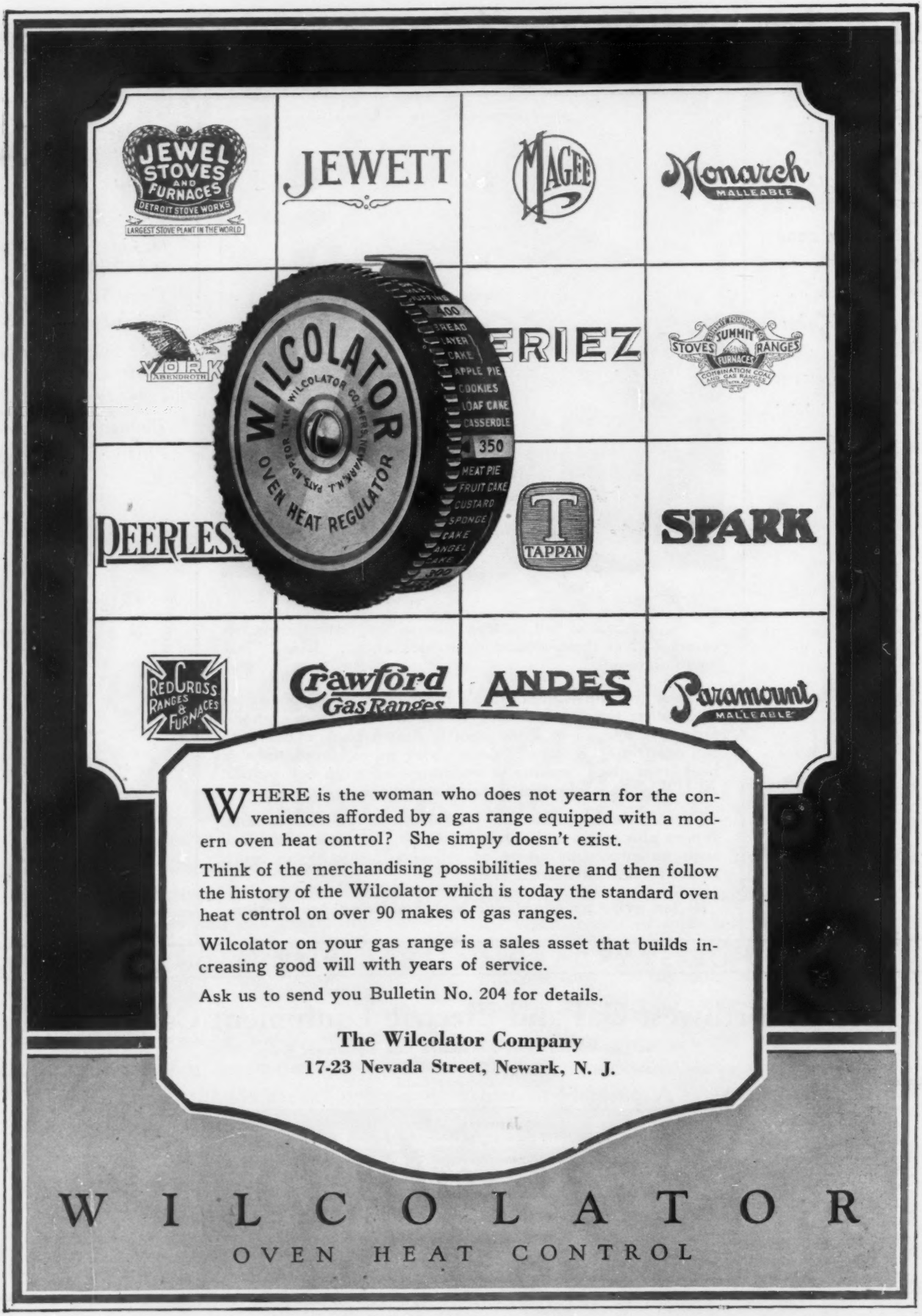
Pacific Coast Distributors, Standard Gas Equipment Corp.

372 Pittock Block, Portland, Ore.

2nd & Brannan Sts., San Francisco, Calif.

164 So. Central Ave. Los Angeles, Calif.

Smoothtop
REG U.S. PAT. OFF.
GAS RANGES



WHERE is the woman who does not yearn for the conveniences afforded by a gas range equipped with a modern oven heat control? She simply doesn't exist.

Think of the merchandising possibilities here and then follow the history of the Wilcolator which is today the standard oven heat control on over 90 makes of gas ranges.

Wilcolator on your gas range is a sales asset that builds increasing good will with years of service.

Ask us to send you Bulletin No. 204 for details.

The Wilcolator Company
17-23 Nevada Street, Newark, N. J.

W I L C O L A T O R
OVEN HEAT CONTROL

WESTERN GAS

626 S. Spring Street,
Phone TUcker 8982
Los Angeles, Calif.

447 Sutter Street
Phone GArfield 2772
San Francisco, Calif.

Official Publication Of The
Pacific Coast Gas Association

Contents for January

What Will 1928 Bring to the Western Gas Industry? 17

Beautification of Gas Properties Has Tangible Value 20
By R. J. Daugherty

How One Gas Company Uses Its Own Fuel 21
By Robert H. Taylor

Compressor Plant Design and Operation 22
By Elting Henderson

The Venting Problem 24
By Walter M. Berry

Natural Gasoline By-Products for Enriching Water Gas 26
By Wm. W. Odell

Pacific Coast Gas Association 28

Editorial 30

We Cannot Afford to Neglect the Domestic Field 31
By L. J. Brundige

Oil Absorption of Natural Gasoline 32
By W. K. Lewis

This Month's Patents Pertaining to the Industry 33

A Manual for Gas Appliance Adjustment Workmen 34

Gas Boiler Solves Novel Problem 38
By Earl S. Hayman

With the Metermen 42
The New Foxboro Meter ..... *By M. O. Jensen*
Specific Gravities of Wet Gases ..... *By E. G. Hoggard*

Natural Gas Gasoline Operations 56
Specific Gravities of Wet Gases,
By E. G. Hoggard

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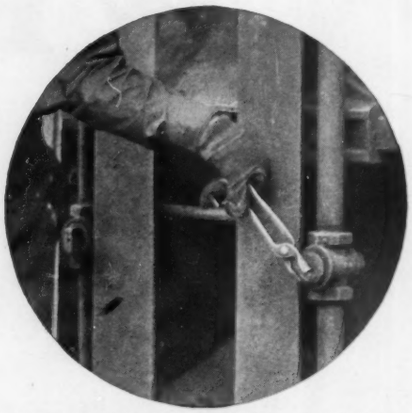
SIMPLICITY

1—Inspecting a Flue

Here Is the Complete Story of Heat Control on a Semet-Solvay Coke Oven Battery



2—Stopping Fuel Gas Flow to Make Burner Adjustment

Ready access to oven burners enables a workman to maintain perfect flue control.

The small number of flues per oven and the ease of adjustments make regulation fast and easy.

Maintaining desired oven temperatures results in:

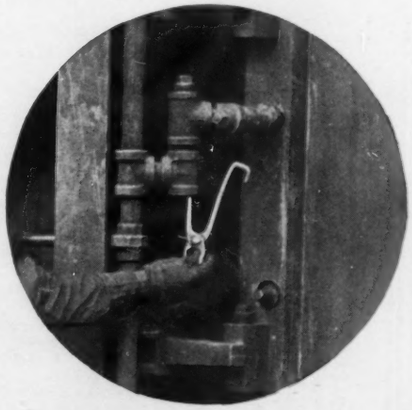
Shortest coking time

Lowest B.t.u. requirement per ton of coal carbonized

Highest yields of all products

3—Adjusting or Changing the Burner or Diaphragm

The great simplicity, strength and thermal efficiency of the Semet-Solvay Oven is being recognized by gas engineers everywhere.



4—Cleaning the Gas Burner

SEMET-SOLVAY
ENGINEERING CORPORATION
Division Allied Chemical and Dye Corp.
40 RECTOR ST. NEW YORK

WESTERN GAS

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

What Will 1928 Bring *to the* Western Gas Industry?

STANDING on the threshold of a new year the gas industry, in company with all business enterprise, does well to analyze its position, to attempt to determine how it will be affected by general business trends, and finally to establish insofar as can be done in advance, whether the 1928 tone will again be optimistic, with a continuation in the consistent advances registered in past years, or whether the industry should look to a period of comparative retrenchment.

Unquestionably the gas industry's progress over a period of years must reflect and be limited by general business conditions. Confidence in the fundamental soundness of American business makes this fact a sign of encouragement—for just as surely as the general trend of business is upward, despite such temporary lulls as that of the year just closed, so must the course of the gas industry be forward. And because of the stabilization of the gas industry its "year to year" position is much stronger than that of general business. Dealing in a necessity, with its load spread over an ever-increasing diversity of demand, it is able to hold its pace of advance even during periods when the general business curve inclines slightly downward.

Thus, preliminary estimates for manufactured gas sales in 1927 show an increase of 20,000,000,000 cu. ft. over the high record set in 1926, and not for 21 years have annual sales and gross revenue failed to register a gain. The tremendous strides that have been made this last year in natural gas transmission and utilization are evidence of what may be expected of this important branch of the industry in the year to come.

An industry should look to its leaders to set the key-note for the future. Therefore, *Western Gas* in a spirit of honest inquiry last month asked a number of representative gas executives, active in Western communities, for their opinion on what 1928 holds for the gas industry. We print the replies below. Some of them deal in generalities, but generalities based upon breadth of view; many of them point to 1927 progress as the basis of 1928 optimism. Here and there we read a note of timely caution against building too far in advance of economic demand, but the burden of all of the statements which are based upon territories served by individual gas properties is that either marked advances over 1927, or at least normal increases over last year, are confidently anticipated for the year now beginning.

The statements made in reply to *Western Gas'* request are given below:

FROM THE A. G. A. HEAD

NOT forgetting its material advancement and its rapid march into new fields of utilization, the one factor of brightest significance in the gas industry during 1927 seems to me to have been the extraordinary manifestation of public interest in the present and future development of a business already long past its first century of uninterrupted public service.

The newer domestic applications of gas fuel, such as house heating and refrigeration, have caught the popular imagination. . . . The development of automatic gas appliances, for meeting the fuel requirements in the home, has already reached a state of perfection which meets the most exacting demands of our customers. . . . The development of appliances and rates for a wider application of gas in industry has also reached a point where gas is now recognized as the cleanest, most convenient and sanitary fuel for manufacturing purposes. . . .

Gas companies have learned not only to produce, but to market, the valuable by-products of gas manufacture. Important experiments in combustion and long-distance transmission of gaseous fuel have, in many places, reached the stage of practical application. . . .

The gas industry builds, not for the year immediately ahead, but for five, ten and even twenty-five years. Additional gas making capacity under construction at the present time is designed in most cases to take care of increased future demands as well as to relieve the pressure on present facilities.

The year to come, in my judgment, will continue to witness the steadily widening availability of gas fuel, both as the result of the gas companies' initiative and of the desire for clean, efficient and economical heating service on the part of manufacturing concerns as well as the general public.

O. H. Fogg,

President, American Gas Association, New York, N. Y.

PROGRESS—EVEN IN "LEAN TIMES"

AS LONG as the electric and gas utilities continue to increase the efficiency and production of individuals and industries they will grow, in my opinion. They will grow more rapidly in good times than during periods of temporary recessions, but even in lean times they possess the ability to show progress and maintain earnings at a point sufficient to secure the inflow of new capital for additions and extensions. . . .

While at present general business conditions in the territories in which these (H. M. Byllesby & Company) companies operate (with some few exceptions) are not as good as a year ago, I do not believe that anything approaching "hard times" is in prospect for 1928. In the Central Northwest conditions have improved, due to a better agricultural situation. Despite low prices for petroleum, business in Oklahoma is surprisingly good. Nevertheless, I believe that this is a time when caution should guide both business and political action—one in which individuals should exercise co-operatively the greatest of care towards preserving the largest possible degree of general prosperity. . . . That the country as a whole is in a period both of economic readjustment and a lull in the recent pace of development hardly can be doubted. The utilities, like all other business interests, must face this situation squarely. While I do not believe that the utilities are overbuilt, I think that the next year will witness a reduction in construction activities. In the case of our own companies, the construction planned for the next twelve months is about two-thirds the total planned one year ago.

John J. O'Brien,

President, H. M. Byllesby & Company, Chicago, Ill.

WILL CONTINUE STEADY GROWTH

OUR Gas Department during 1927 exhibited the same steady growth which has always characterized this branch of our business, and we expect it to continue to do so through 1928. There is nothing spectacular about the artificial gas industry. It is as prosaic as bread and butter—and as substantial.

Since the formation of the San Francisco Gas Company three-fourths of a century ago, the progress of this essential adjunct to domestic life and commercial activity on the Pacific Coast has been steady, strong and sure. There are now somewhat in excess of 450,000 active meters connected to our distribution mains, a gain of over 200,000 in the past decade. Of these, not more than 25,000 consumers were added through the acquisition of existing utilities, the remainder representing the normal growth of business in our territory.

Our construction budget in the Gas Department for 1928 calls for the expenditure of somewhat in excess of $4,500,000, including such features as the laying of a 16-inch main from our Potrero plant to San Bruno, and the further expansion of our "super gas system" by extending our high pressure mains from Oroville to Chico, a distance of twenty-four miles, and from Stockton to Lodi. As a result of these extensions the existing plants at Chico and Lodi will be dismantled. This is in line with the company's established practice of serving as wide a territory as practicable from large, economical and conveniently located gas generating plants, in preference to giving service from relatively small and isolated units.

A. F. Hockenbeamer,

President, Pacific Gas and Electric Company, San Francisco, Calif.

SEES GROWTH IN SOU. CALIFORNIA

SOUTHERN California Gas Company anticipates the expenditure of over three million dollars for extensions and betterments of their system during the year 1928. In serving gas to domestic customers it is estimated that our growth will include the addition of fifteen thousand meters in various parts of our system. In addition to laying service and setting these meters for domestic consumption, we expect that the steadily increasing industrial growth of this territory will add considerably to the number of the indusrial users of gas. In a normal growth of our company during the year we expect to lay over two hundred miles of mains, and add to our plant equipment as may be necessary.

A. B. Macbeth,

President, Southern California Gas Company, Los Angeles, Calif.

MAY BE BEST GAS YEAR IN A DECADE

ALL experts agree that 1928 will at least be a fair year for Pacific Coast business and many see indications that it will be a year of large expansion. Whatever the general business tempo, the gas industry will continue its steady growth. There is, in fact, every possibility that the rate of growth of gas sales may be greatly accelerated, because gas company managements have been impressed by recent surveys showing the latent water heating and space heating business located on existing lines. If adequate sales effort should result, 1928 will be the best gas year in a decade.

Clifford Johnstone,

Executive Secretary, Pacific Coast Gas Association, San Francisco, Calif.

GAINS PER METER SHOWN

NEW applications of fuel gas to domestic and industrial uses have materially broadened the market for gas service; and improved methods of utilization in old fields have entrenched the industry more firmly than ever before.

The testing and approval of appliances by the laboratory of the American Gas Association is gradually building up a more complete public confidence in gas service. This also is an element of strength to the business.

Locally the situation is indicated by the fact that the gas consumption on our own system was 52,300,000 British thermal units per active meter during 1927, as compared with 42,900,000 British thermal units per active meter five years ago, or during 1922.

William Baurhyte,

President, Los Angeles Gas and Electric Corporation, Los Angeles, Calif.

"BIGGER AND BETTER" IN MID-WEST

UTILITIES in the Middle West making and selling gas for city uses start the year of 1928 with a satisfactory record behind them and with prospects for a bigger and better ensuing year.

New interest in the business has been aroused because gas utilities not only constantly work to maintain and increase the household uses of gas they have secured, but are attracted by competitive fields of fuel, many of which can absorb properly large volumes of gas at profitable rates. The efforts to enter these markets furnish interesting problems and add zest to the business. The cheerfulness and expectancy with which utilities approach these highly competitive fields is gratifying.

Geo. B. Evans,

President, The Laclede Gas Light Company, St. Louis, Mo.

BIG THINGS IN SOUTH TEXAS

THE NATURAL gas companies of South Texas close the 1927 season with sales around one hundred and seventy-five million feet daily. The Houston Pipe Line Company has increased its business to one hundred million feet daily and having completed one hundred fifty miles of new extensions and loops will enter 1928 with facilities

to increase deliveries 25 per cent. With new fields developed and many new wells sufficient to assure a full supply and with practically all industries turning to natural gas fuel and a rapid increase of domestic consumers the coming year promises to find South Texas using 250 million feet daily. This large volume of business has been developed in the past three years and with major pipe line and field developments practically completed the South Texas natural gas business will find 1928 affording a larger and more satisfactory year to all of the half dozen natural gas companies of this section.

A new pipe line system to the Rio Grande Valley section and a second system to the Beaumont-Port Arthur district will come into service and will add largely to the total business of 1928. This, as well as increased business by the completed pipe line systems covering all of the South Texas section from the Louisiana line to the old Mexican border will assure rapid industrial growth throughout this large section.

C. B. McKinney,
General Manager, Houston Pipe Line Company, Houston, Texas.

NO FIREWORKS—BUT STEADY GROWTH

IN PORTLAND, OREGON, the outlook for the forthcoming year in the gas industry is only for a steady rate of growth. In common with the rest of the country, building operations in this section have slowed down somewhat and the Portland Gas & Coke Company does not anticipate taking up as many new customers as in previous years.

At the same time the intensive reaching out in suburban territories during the past few decades has pretty well gridironed the territory adjacent to the city of Portland with gas mains and therefore, not many main extensions in new territory are contemplated during the coming year.

On the other hand, due to improved gas appliances and to closer contact with consumers by means of cooking schools and other demonstrations, together with much educational propaganda the sales per residential consumer are now on the incline. This is quite gratifying, in view of the tendency during the past decade for the individual consumption per domestic account to drop off, largely due to the lesser amount of prepared food in the home.

The above is entirely apart from increases in gas sales for house heating purposes. The moral is hence that intensive new business efforts will counteract the tendency for the residential consumption to drop off.

The house heating load during the past several years has not shown the startling rate of increase previously experienced, this being due largely to the competition of oil and to various devices for more conveniently and efficiently burning solid fuels, such as coal and mill refuse.

The Portland Gas & Coke Company added during 1927, additional generating capacity of five million cubic feet and it is not contemplated to add to the generating capacity during the coming year. A number of improvements, however, will be made to improve operating efficiency.

The company has had a very successful year in by-product operation. By the end of the year we will have disposed of 53,000 tons of briquets, 2,000,000 gallons of benzol and practically 1,000,000 gallons of road tar. The company also had a most successful year in the volume of appliance business in spite of very aggressive electrical competition.

A new era in the history of the Portland Gas & Coke Company will be ushered in on the first of the year by the moving into the new sixteen-story Public Service Building, which will also house the company's affiliated properties, the Northwestern Electric Company and Pacific Power & Light Company.

E. L. Hall,
General Superintendent, Portland Gas & Coke Company, Portland, Oregon.

EXPECT TWENTY PER CENT GAIN IN OKLAHOMA

RESPONDING to your telegram of December 8th, the outlook for the gas industry in Oklahoma for 1928 is extremely bright.

While crop conditions in Oklahoma were not as good in 1927 as in the banner year of 1926, yet they were, on a whole, above normal and the price received for the crop totaled an even greater amount in the aggregate than for the year of 1926. The wheat section is in excellent condition. Crop prospect for 1928 is good.

All of the important towns in the state are undergoing a very splendid growth. This is particularly true of the two larger cities, Oklahoma City and Tulsa. Oklahoma City, during the past year, has increased approximately fifteen thousand in population. There is, of course, some depletion in the gas fields, but, fortunately, new fields are being developed every day and there is very little chance but that an adequate amount of gas will be produced to take care of the demand.

Plans are under way looking toward the building of a line from Oklahoma City to the Texas Panhandle field. This line will be available for the winter of 1928 and 1929. This line will serve as a stabilizer and will tap the wonderful gas reservoir in the Texas Panhandle.

The total of gas marketing in Oklahoma for 1928 should exceed 1927's total by at least 20 per cent.

J. F. Owens
Vice-President and General Manager, Oklahoma Gas and Electric Company, Oklahoma City, Okla.

"BANNER YEAR" FOR DENVER

PUBLIC SERVICE COMPANY of Colorado predicts a banner year in all of its properties during 1928. This is based upon general business conditions in the territory served, to the settlement during the past year of several matters of extreme importance and to the advances shown in 1927 over previous years.

The project of bringing natural gas to Denver from the Amarillo, Texas, field has been definitely settled and work on the pipe line has been started. The line will be rushed to completion, and it is expected that natural gas will be available for use in Denver about September 1, 1928.

The pipe line will be approximately 380 miles in length, composed of 22-inch and 20-inch pipe and will cost, in addition to acreage reserves, approximately $22,700,000. The amount of money to be expended in Denver in adapting the distribution system and appliances to the use of natural gas is estimated at $2,000,000.

The use of natural gas in Denver is expected to open up large possibilities in industrial and house heating service, heretofore restricted with manufactured gas.

Clare N. Stannard,
General Manager, Public Service Company of Colorado, Denver, Colo.

GROWING THROUGH SALES EFFORTS

DURING the past twelve months our company has enjoyed a growth of approximately 9 per cent in the number of active meters on our entire system. Looking to the future, we see no reason why in 1928 our company, as well as other gas companies in Southern California, should not duplicate the performance of 1927 in the way of a substantial but not spectacular growth.

Our company is at this time making the greatest effort in its history to increase, through the activities of our commercial department, the use of gas

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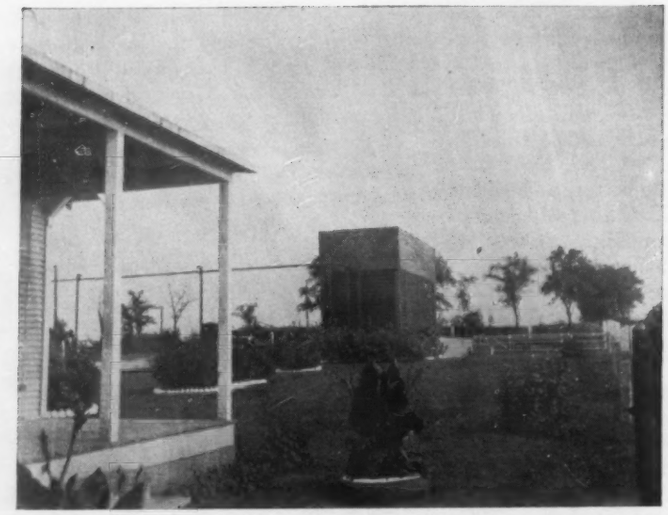

Yard scene at Dilworth Compressor Station, Dilworth, Oklahoma

Beautification *of* Gas Properties Has Tangible Value

By R. J. DAUGHERTY
Cities Service Gas Company

THE Cities Service Gas Company, which is one of the principal subsidiaries of the Empire Gas & Fuel Company, is outlining a very extensive program of beautification of their different compressor stations and pipeline divisions. While this will necessitate the expenditure of a considerable amount of money, the officials of the company see the tangible value of such a program. At this time the Cities Service Gas Company has twenty-five compressor stations which are distributed over its twenty-seven hundred miles of gas pipe line, together with eighteen pipeline division stations. While the beautification of yards about these stations has been carried out to some degree, still no concerted effort has been put forth which would eventually culminate in securing a similarity of both yard beautification and station signs.

EIGHT STATIONS ADDED

Approximately eight new compressor stations have been added this year and the company is now contemplating employing a landscape gardener who will superintend the planting of trees, shrubbery, flowers and grass. While this idea has been carried out in the older properties, still a question of the thorough knowledge of the soil at different points is essential to the success of such an undertaking. In some places it will be necessary to haul rich dirt to be mixed with the soil already there in order to bring up its production qualities. Wherever this is necessary it will be done. This new work is designed to be of an educational nature also, and the gardener whom we employ will instruct one or two men at each plant in the proper care and handling of plants, shrubs, etc.

This work will start in the spring of 1928 and it is our intention at this time to make the Wichita Compressor Station at Wichita, Kansas, one of the show places of our properties. This will serve as a model for other stations, so that the use of similar designs will impress the traveler going through the country. Wherever possible the "Doherty" emblem will be worked out in the yard of the station, using different colored shrubbery. Flower beds, of course, will be in abundance and placed in such positions as can readily be seen from highways. No particular selection of trees has been made, this feature to be left up to the judgment of the gardener.

The plant property will all be painted with the exception of the buildings, which are builded with corrugated sheet iron. These will all be finished inside and the concrete floor will be covered with a special concrete paint coating. This coating acts as a preserving agent to the concrete, and also makes it easier for the oil to be wiped from the floor. The fence posts around the property will be painted an ash gray, with about an eight-inch white topping. This is the regulation color used throughout the properties. Three-inch pipes are used for posts and the wire run through holes which are bored through the pipe. The main driveway entrances are to be made with ten-foot pipes with a cross bar at the top. On each cross bar will be hung a sign such as "Cities Service Gas Company," and directly under "Wichita Compressor Station." The Doherty emblem will probably be placed on top of the bar. This same sign will appear on all water tanks, and these, together with the entrance signs, will be under electric lights at night. Signs will also be placed on buildings so that the traveler will have every opportunity to determine ownership of the property. The company also has over five hundred meter houses and measuring stations. Each of these will be repainted where necessary and a sign put on them. All of our measuring stations which have been recently completed have been fenced in and the posts painted with the regulation colors. Silver paint is being used on the large gas pipes which enter and leave the building. Where

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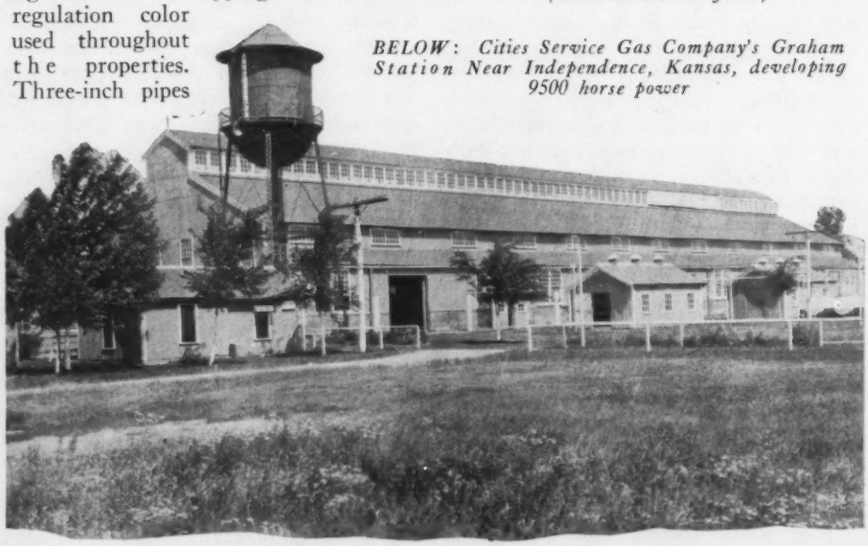
BELOW: Cities Service Gas Company's Graham Station Near Independence, Kansas, developing 9500 horse power



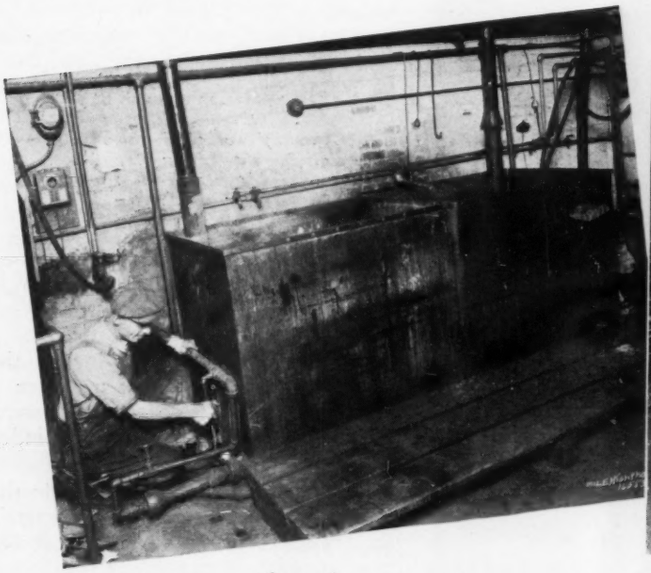
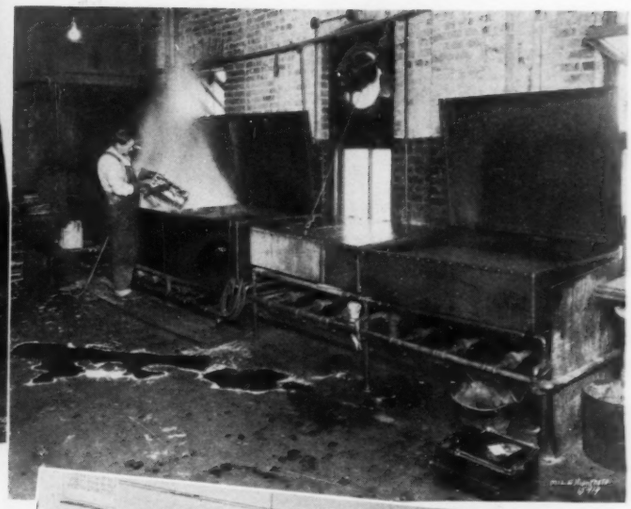


Figure 1



Top, Figure 2—Bottom, Figure 3

How One Gas Company Uses Its Own Fuel

By ROBERT H. TAYLOR

Engineer of Gas Utilization
Public Service Company of Colorado

FOLLOWING is another of Mr. Taylor's interesting descriptions of industrial uses for gas in Denver, Colorado. Gas in can manufacture, and gas in the potato flake business have already been treated in this series of articles. Gas in the Denver baking industry will be next in order. The present installment is something different—a brief outline of how the Public Service Company of Colorado uses the artificial gas which it produces, for some of its own shop operations.

A FEW weeks ago, when several utility men were engaged in a discussion which ranged all the way from cabbages to kings, a tramway man asked why it was that the gas journals rarely told how the gas company uses its own product. He said that for several years he had occasion to read two gas publications and he could remember only one or two articles which dealt with the utilization of gas by the gas company.

There is a lot of truth in this accusation. And there is a good reason why such a condition exists. As a customer, the gas company is only one of many. Gas men are "gas-minded" and rarely consider other fuels for their own purposes. Aside from the plant, most of the operations which require heat have this heat supplied by means of gas. In most cases this is a condition which has existed so long and so generally that it is accepted as standard. When new uses for gas fuel are found in some department of the gas company, these uses are immediately applied to the customer by the new business department and since refinements are usually included in this latter application, it is logical that the latter be described in the trade journals, rather than the experimental installation made by the company for its own use. Then there is another reason. It is more convincing to tell how a customer's problem was handled than it is to relate what the company has done in its own shops. Comparisons are easier to make.

However, there are instances when the procedure is reversed and the idea is proven on the customer's premises before it is accepted and employed by the gas company. This is true in the case of the immersion type heater. Several of these heaters had been made up and placed in customer's service in Denver before the Public Service Company of Colorado began to use them in its own work.

RECONDITIONING APPLIANCES

Very frequently, when new ranges, water heaters or other appliances are sold, they replace old equipment and these old appliances are returned to the shop, the customer getting a small credit for them. Often the old appliances are in fair shape and, if cleaned and some broken parts repaired or replaced, can be resold with resulting profit to the company. This is particularly true in the case of water heaters, where an automatic storage heater replaces one of the circulating type.

The biggest problem in reconditioning used appliances is the cleaning. If it be a range, the grease has worked into corners and crevices and the labor cost of hand cleaning often is much greater

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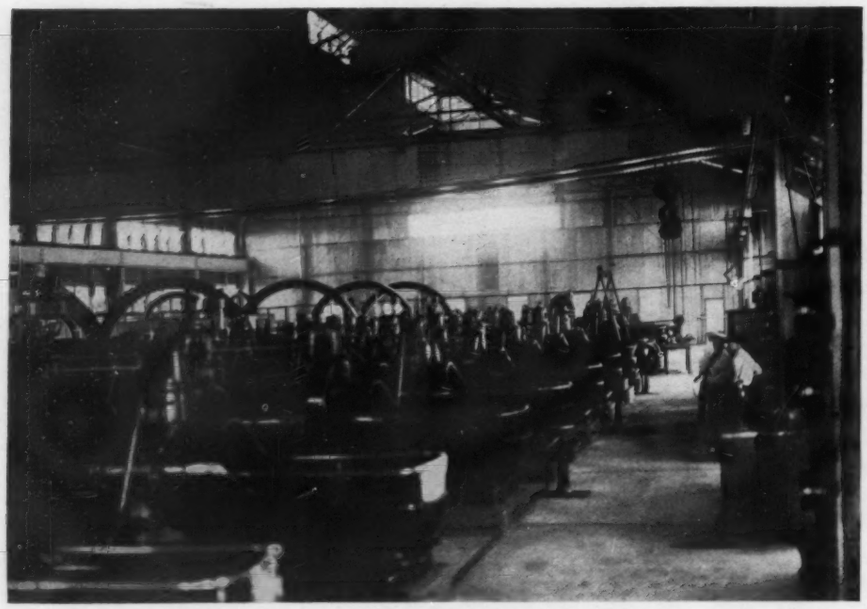


LEFT: Interior view of Station "A," Southern California Gas Company's original compressor station, erected in the Taft, Calif. fields in 1913-14—the first compressor plant in the West. Units shown are 960 H. P. Coopers

Compressor Plant Design *and* Operation

By ELTING HENDERSON
Southern California Gas Company

IN compressor station construction the first problem to be considered is size or capacity, which will be governed by the quantity of gas available and contemplated, bearing in mind that additions to or subtractions from equipment installed will at some time be necessary; hence the general design will be such as will lend itself readily to capacity changes with a minimum of disturbance to operation.

UNIT CONSTRUCTION

The unit type of construction is most adaptable to these conditions. By this is meant a compressor unit, bay of building, set of control valves, cooling unit for gas and water, and possibly auxiliary pumps for circulating water. While the question of individual pumps or an auxiliary unit large enough to take care of the whole plant is debatable, the writer prefers the large unit because in his experience each small pump is found to require practically as much attention and as much repair labor as the large one, thus increasing the maintenance cost materially when the individual pumps are installed. Of course, the large auxiliary units where used should be installed in duplicate, and—which is vitally important—they must be of ample capacity. Probably the most common mistake in compressor station design is made by stinting on the auxiliary apparatus. When it is considered that the cost of the auxiliary equipment is but a small part, 10 to 15 per cent, of the total station cost, and the satisfactory operation of the station is dependent on the auxiliary, the fallacy of saving a few hundred or a few thousand dollars in first cost and later rendering inefficient a plant costing ten times as much is evident.

In planning the amount of water to be used, a practical method is to provide .4 gallons per H.P. for jacket water, which will give approximately 20° F. rise in temperature or slightly less. This is found by assuming that 35 per cent of the heating value of the fuel gas is carried away in the jacket water and adding to this heat 10 per cent for that dissipated into the compressor jacket water; also assuming 10,000 B.t.u. per B. H. P. per hour, which is common practice in four cycle gas engine operation. A greater or lesser amount of circulating water will naturally only decrease or increase the temperature rise; however, a 20° rise should not be greatly exceeded in the cylinder jackets, owing to the casting strains that are set up when a wide variation in temperature between the top and bottom of the cylinder exists.

Unless the scale forming solids in the water are less than three grains per gallon, the jacket water should be cooled in a closed system, where the same water is re-circulated, which is standard practice in the West. In the closed system there are three methods of effecting the heat transfer in general use, viz., shell and tube exchangers, surface exchangers and pipe coils. The rate of transfer varies with the velocity of the water in the pipe or tubes, and outside the tubes in the shell and tube exchangers, with the velocity in the pipe coils and tubes in the surface exchanger and with the mean difference in temperature in all cases, so it is difficult to state even an approximate amount of cooling surface that will be necessary. To take one set of conditions, given a mean temperature difference of 30° F., .75 square feet of surface per H.P. for copper base tubes or 2½ to 3 square feet in steel or iron pipe per H.P. will be found ample if an internal velocity of 160 feet per minute or more is maintained.

Low temperature is not important for gas cooling if effected only for transmission, and about twice the above per H. P. will be ample; however, the amounts of course vary with the ratio of compression and no accurate amount can be stated until all the conditions are known.

The tower water necessary for jacket and gas cooling where the closed jacket system is used is about .8 gallons per H.P. As stated before these amounts are only a rough approximation, but are sufficiently close to determine the capacity of pumps and lines. From an operating standpoint the location of the pumps should be selected, if the topography of the site permits, so as to maintain a submerged suction—especially if centrifugal pumps are used.

CLEANING LUBRICATING OIL

Most manufacturers provide some sort of cleaning system for lubricating

oil, but none of them in my opinion is sufficiently thorough for good operation. Centrifuging is the only practical thorough method of cleaning lubricating oil that I have ever observed, and while not necessary if the circulating oil is thrown away and the system cleaned of accumulated dirt and carbon often enough, this is very rarely the case.

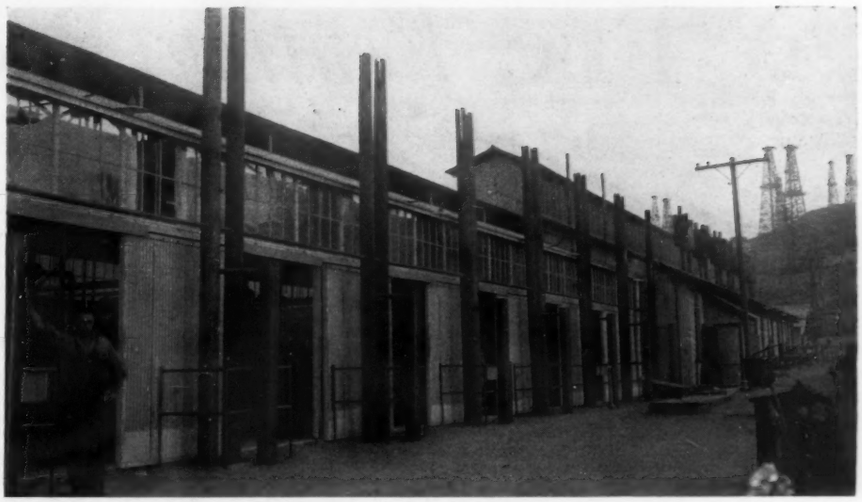
Size of units will be determined by the size of total installation. The mistake of installing a few large units, say two or three, when twice that number of smaller size could be as easily installed, should not be made. The lack of flexibility of the small number of large units is apparent.

The designer should familiarize himself with safety devices as prescribed by law and avoid considerable grief and expense later on when the inspector makes his first visit. In addition to the legal requirements, quick closing or remote control valves on incoming lines and non-return on discharge lines should be provided.

Orifice flanges should be installed in the main water, gas and fuel lines so that results may be checked when desired, even if the volumes are not constantly measured; and since temperatures bear an important relationship to efficiency and operating conditions, thermometers or thermometer wells should be provided on each distinct gas and water line and cylinder. Operating valves on gas lines should be placed outside of the building proper and should be of the O. S. & Y. type. Safety valves are, of course, provided between each compressor cylinder and its discharge line valve. Two methods of unloading the compressor when starting are in general use, viz., vent to the air and by-pass. In the first method, compressor line valves are left closed and the line is opened to the air until operating speed is reached. The second method places equal pressure on both sides of the compressor until operating speed is obtained. The latter method seems preferable to the writer because there is no loss of gas when starting up nor is there the same possibility of obtaining a combustible gas-air mixture in the compressor piping during the starting operation, as is the case when the first mentioned method is used. Provision must be made for trapping off liquid condensate that may result from the increased pressure or that may get to the plant from the source of gas supply. Neglect of this has wrecked many compressor cylinders.

We estimate that ½ cu. yd. of concrete of 1-2-4 mixture will be required for each H.P. installed. This will include cooling ponds, pipe pits, sidewalk, building and compressor foundations, in fact, all cement work about the plant.

Before passing on to operation I would like to emphasize the importance of adequate auxiliary apparatus. If it is borne in mind that the entire investment is dependent on the auxiliary for satisfactory operation, the very common mistake of providing inadequate auxiliary equipment will not be made.



Southern California Gas Company's Station "D", Signal Hill field

OPERATION:

In this phase of the business there are probably as many different ideas as there are men operating compressor plants. To the inexperienced helper the monotonous repetition of the inspection rounds in which possibly very rarely is anything found that needs attention appears unnecessary and neglect of this important duty follows. For this reason we insist on a timed inspection round at regular 30-minute intervals beginning on the hour and half hour. All other duties of the operator must come between these periods. The stated time for making the round has a value only in that it gives the man in charge an easy means of checking up on the helper and in case a warm bearing develops during the shift it is much easier to determine whether or not it is caused by neglect. In addition to the periodic inspection the operator will depend on a highly developed sense of hearing and feeling to aid him in locating trouble. We provide an operator for each station and an oiler or helper for each 1,000 H.P., also a plant foreman and repair crew if the size of the station warrants. The operating crew is expected to make minor repairs and help on large repairs insofar as their other duties permit. The helper is also made responsible for the appearance of certain pieces of equipment regardless of the shift he may be

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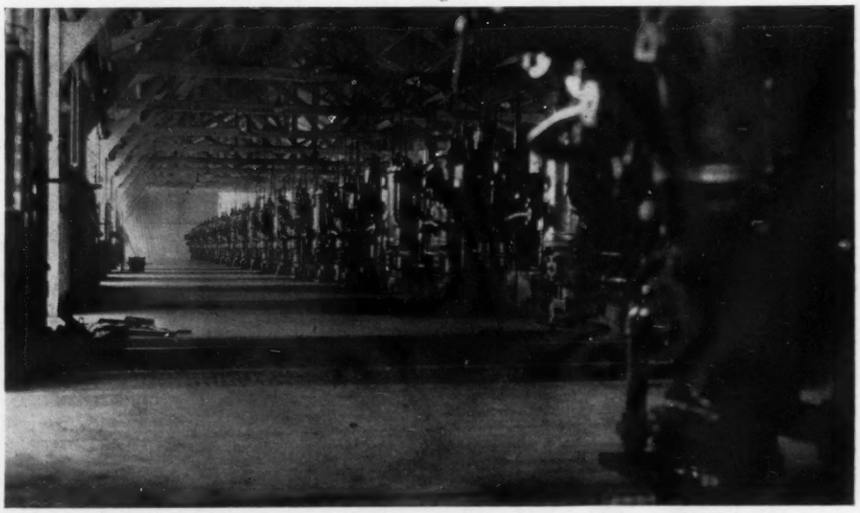

A battery of 21 Cooper engine-compressor units is installed in Standard Gasoline Company's Huntington Beach No. 3, a combination natural gasoline extraction and booster plant

The *Venting* Problem

Second *in a* Series *of* Three Articles *on* Venting Practice

By WALTER M. BERRY
Consulting Gas Engineer

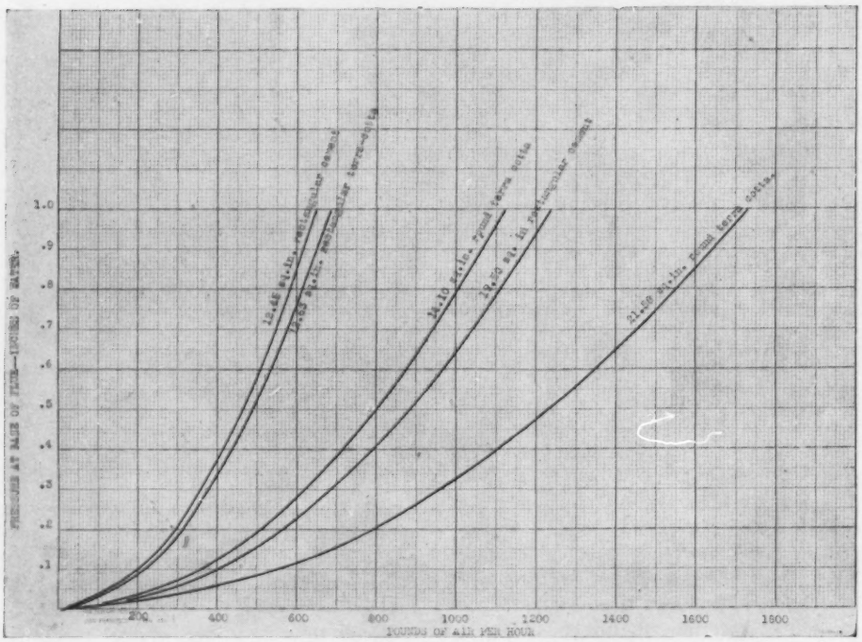

Figure 1. Pounds of air at 60 degrees F. discharged through five sizes of cement and terra cotta flues, 40 feet high at various pressure at base of flue.

IN OUR venting practice we have largely been guided by our experience with appliances using solid fuel, failing to recognize that about the only thing in common is that both types of appliances produce products of combustion.

Contrary to general opinion the venting of gas appliances is much more difficult than the venting of appliances using solid fuels. With the latter, the draft controls the quantity of fuel burned —with gas appliances the volume of products formed is practically independent of the draft conditions. When solid fuel is first ignited the combustion is at first extremely slow, the volume of products is small and if there is even a very slight movement of air up the flue the products are carried off without difficulty. As the flue warms up the draft is gradually increased, the combustion becomes more vigorous and finally reaches the point where the dampers must be closed to control the combustion.

FACTORS IN GAS VENTING

With gas appliances the gas usually comes on with its maximum capacity and since there is usually little if any movement of air up through the flue until the flue has become warmed, the combustion is likely to be poor at first and some products will be vented through the down draft directer until sufficient draft has been established to fully take care of them. Since there is no draft in the flue without heat and no heat can get into the flue without draft, it naturally follows that the flue can be said to have practically no capacity when it is cold. In winter the average temperature of a flue is usually higher than the outside air and there is some movement of air up the flue;—in summer the action is perhaps at times reversed.

In an appliance using solid fuel the presence of smoke or the pungent smell of coal gas in a room is usually a good indication of improper draft conditions. With gas fuel the products are often not distinguishable by the senses until they have accumulated in dangerous quantities. Gas appliances, particularly in the warmer sections of the country, are operated much more intermittently than would be the cause with appliances using solid fuel and the flue has a chance to cool down to a greater degree and become less effective, as contrasted with appliances using solid fuel in which the flue is warmed up in the fall of the year and is not allowed to get thoroughly cool again until the arrival of warm weather in the spring. This condition is a point in favor of the continuously burning pilot lights on appliances using large quantities of gas especially where the draft conditions are not very good. Even a very small gas flame will provide sufficient heat to keep a little circulation through the flue and will reduce the deposition of moisture when the appliance is first lighted.

There is still another condition that makes the venting of gas appliances more difficult. It is generally not considered good practice to vent several gas appliances into a common flue, as is usually the case with solid fuel appliances. More flues are therefore necessary, the use of each one becomes more intermittent, and the flues frequently become almost cold; nevertheless, the flue must take care of the products almost instantaneously when the appliance is turned on.

RATING FLUE CAPACITY

The maximum capacity of a flue can be defined as the volume carried by the flue when all of the pressure produced by the "stack effect" is utilized for moving the products and no minus pressure is shown on a draft gauge at the base of the flue. This condition is of course not reached until the appliance has been in operation for a considerable period of time and the temperature of the flue has reached an equilibrium. From what has been said it should be clear that the proper rating for capacity must be considerably below the maximum capacity in order to take care of the products immediately, and in arriving at the proper figure certain assumptions must be made as to minimum temperatures of the products, and in case the rating is based on B.t.u. consumption, it is further necessary to consider the degree of dilution of the products with excess air.

Appliances are now generally fairly efficient and that means that the flue gas temperatures are not very high, or if they are high, the dilution with excess air is low. With furnaces and water heaters it is perhaps safe to estimate that the products from the appliances will contain fifty per cent of air;—just what further dilution there will be before the products enter the flue will depend a great deal upon the design of the down-draft diverter and the draft created in the flue. It would be perhaps quite conservative to estimate that the pro-

ducts in the flue will contain at least equal volumes of products and air. The flue must therefore handle twice the volume of products produced per thousand B.t.u. consumed.

There is of course no way of knowing what the temperature of the products will be in each individual case and it is therefore necessary to assume the lowest temperature that is likely to be encountered. We shall say that the minimum is 175 degrees at the base of the flue. Basing the capacity on a rather low inlet temperature has the advantage that the flue will automatically take care of large overloads. With a gas consumption in an appliance above the ordinary rating the temperature of the flue products usually increases, there is an increase in the volume of products, the excess air drawn into the appliance is decreased and the volume drawn into the down-draft diverter is smaller, all combining to give a higher average temperature in the flue with no large reduction in the effective draft notwithstanding the increase in gas consumption.

NO ARBITRARY "GOOD DRAFT"

There has been some attempt made by several writers to establish a definite figure for "good draft" and base flue capacities upon such value. In view of the fact that there are a great many one-story homes with very short flues and the very maximum draft that could ever be secured, irrespective of size of flue, would always be very low, it does not seem that we can arbitrarily select some definite desirable draft for all flues irrespective of height of flue, and base the flue capacities on such a figure. It would seem more reasonable to require that the draft should be a certain percentage of the maximum "stack effect." In order to assure a good positive draft very quickly after the appliance is started and to provide sufficient pressure difference to overcome moderate wind pressures that may tend to cause down-drafts, it is necessary to allow only a small pressure loss in the flue. Just what this pressure loss should be is very difficult to say since it will vary with locations, type of installations, velocity of prevailing winds, etc. My estimate is twenty-five per cent for average conditions and this will give a capacity very nearly one-half of the very maximum capacity of the flue. Any increase in capacity over this fifty per cent will rapidly reduce the effective draft and any decrease in capacity lower than fifty per cent will not give sufficient improvement in draft conditions to be important except where the draft conditions are particularly bad.

In a series of tests conducted by the writer for the Gladding-McBean Company of Los Angeles and the Gas Furnace Association of Southern California, the actual capacities of five sizes of flues were carefully determined. The flues were regular stock material of the following sizes:

"5 inch" diameter round terra cotta having an actual cross sectional area of 21.58 sq. inches.

"4 inch" diameter round terra cotta having an actual cross sectional area of 14.10 sq. inches.

"2x6¼" rectangular terra cotta having an actual cross sectional area of 12.63 sq. inches.

"2x6¼" rectangular cement having an actual (average) cross sectional area of 12.45 sq. inches.

"2x10" rectangular cement having an actual (average) cross sectional area of 19.50 sq. inches.

These five flues were installed side by side in a large open shed in which the temperature was approximately the same as the outside air. The outer surfaces of the flues were exposed to the air and the heat losses were slightly higher than would be the case in an actual installation where the flue is usually insulated more or less by the building structure.

In order to get real basic data on the relative capacities of these flues, uninfluenced by temperature variations, the capacities were first determined with air at room temperature. The air was supplied by an ordinary fan blower, forced through a six-inch pipe in which it was measured with a carefully calibrated pitot tube, then passed into the base of the flue. A calibrated slope gauge capable of being read to 0.002 inches of water pressure was used to measure the draft at the base of the flue. It was found necessary to place the draft gauge connection considerably below the point where the air entered the flue in order to eliminate false reading caused by turbulence.

The capacities of the five flues with air at 60 degrees are shown in Figure 1. If the heat losses were proportional to the quantity flowing through each flue, the actual capacities with warm flue products would have the same relation as their capacities with cold air. The heat losses will vary, however, with size, shape, height, quantity flowing through and inlet temperature, and it is impossible to calculate from the cold air data alone the capacities with warm products. The data were of very great value, however, after additional information had been gathered on heat losses.

TESTS WITH WARM AIR

Following the first series of tests the capacities of the five flues were determined with warm air at various inlet temperatures. After the air was measured it was passed through a warm air furnace and into the base of the flue. Thermometers were inserted at six foot intervals into the flue and readings were made after the temperatures had come to an equilibrium following each change of air rate or inlet temperature.

The tests with warm air were made with three heights of flue—approximately 20, 28 and 40 feet. More than two thousand readings were made in the course of the tests.

The figures in Table 1 are based on a twenty-five per cent loss in draft, and this basis of rating the flues is perhaps approximately right for general purposes. However, it does not show the real dif-

(Continued on Page 55)

TABLE 1.—CAPACITY OF FLUES—HEIGHT 40 FEET
No Allowance Made for Loss in Draft in Vent Connection.

	"5-Inch Round" Terra-Cotta 21.58 Sq. In.	"2x6¼-Inch" Rectangular Cement 12.45 Sq. In.	"2x6¼-Inch" Rectangular Terra-Cotta 12.63 Sq. In.	"4-Inch Round" Terra-Cotta 14.10 Sq. In.	"2x10-Inch" Rectangular Cement 19.50 Sq. In.
Inlet Temperature of Products (Degree F.)	175	175	175	175	175
Average Temperature in Flue (Degree F.)	145	106.5	121	131.5	133.5
Total "Stack Effect" (Inches)	.084	.0475	.0620	.070	.072
Loss in Draft (Inches)	.021	.0119	.0155	.0175	.018
Available Draft (Inches)	.063	.0356	.0465	.0525	.054
Capacity (Lbs.)	269	74	90	159	178
Capacity (M. B. t. u.)*	171	47	57	101	113

*One cubic foot of 1100 B. t. u. Los Angeles natural gas will produce 11.50 cu. ft. of products weighing 0.850 lbs. With equal volumes of air and products the total weight for one cubic foot of gas will be 1.73 lbs. The capacity of the flue in M. B. t. u. per hour will therefore be—

$$\frac{\text{Capacity in pounds} \times 1100}{1.73 \times 1000}$$

Natural Gasoline By-Products *for* Enriching Water Gas

By WM. W. ODELL
Fuel Engineer,
Bureau of Mines, Department of Commerce

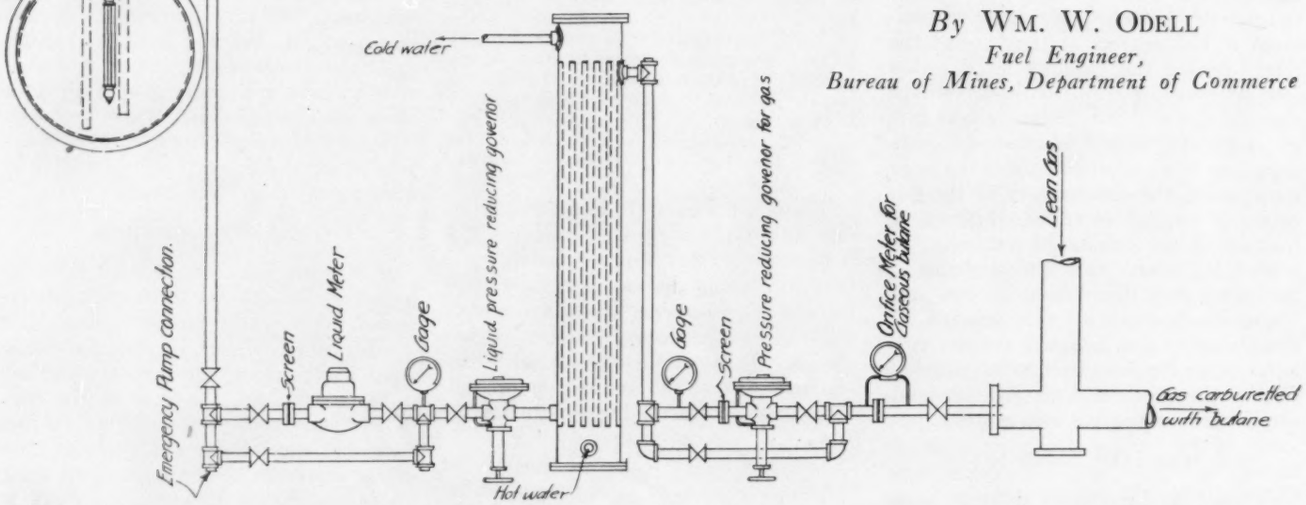

Figure 1. Showing diagrammatically a means for using gas-enriched gasoline, similar to that used in Bureau of Mines experiments at Muscatine, Iowa

¶ Mr. Odell's interesting study, published herewith, was prepared as Bureau of Mines Serial No. 2840, November, 1927, under the title "The Carburetion of Combustible Gas with Butane and Propane-Butane Mixtures with Particular Reference to the Carburetion of Water Gas."

FOR a number of years there has been a very appreciable annual increase in the production and recovery of natural gas and natural-gas gasoline[1] in the United States, the latter product being used largely for blending with gasoline from petroleum in the production of motor fuel. On account of the increased amount of oil cracking in the production of gasoline and the accompanying increased percentage of low-boiling constituents in the resulting product, the specifications for the natural gasoline suitable for blending have been altered, that is, the amounts of propane and butane which it can contain have been limited. The result has been that large quantities of the latter materials are wasted because there has been no ready market for them in large quantities. Because of this wastage and because it is probable that large quantities of these and similar materials will be produced in the near future as a result of the more general use of oil cracking processes, a study was made by the Bureau of Mines, under a co-operative agreement with the assistance of the Phillips Petroleum Company, of the suitability of these materials alone or in mixtures for use as gas enricher in the carburetion of water gas for city distribution.

This investigation included:

a. A study of the properties of the low boiling members of the paraffin series, including pentane, with particular reference to their utilization as gases.

b. Calculations of the composition and properties of gases of various heating values made with water gas as a base using chiefly butane and propane-butane mixtures as enriching materials.

c. Consideration of the influence upon the numerous variable factors in the manufacture of carbureted gas of replacing gas oil (the present enriching material) by propane, butane or mixtures of the two.

d. An estimate of the influence of such a change upon certain important items of cost in the manufacture and distribution of carbureted gas.

e. And, subsequent to the foregoing, tests were made in a small gas plant, using as enricher, by carburization without cracking, a product comprising chiefly butane but containing small amounts of propane and pentane, entirely replacing gas oil. This product was furnished by the Phillips Petroleum Company, and is named by them "G. E. Gasoline," meaning gas-enricher gasoline. The influence upon the important factors re-

1.—Including casing-head gasoline.

Table 1.—Some of the physical constants and properties of a few of the hydrocarbons of the paraffin series.

	Boiling point.	Weight of liquid per gallon.	Specific gravity of the gas at	Cubic feet of gas per gallon of liquid at	B.t.u. per gallon of liquid	B.t.u. per cu. foot of gas at 60° F. and 760 mm pressure.	Specific heat of gas at constant pressure	Latent heat of vaporization of liquid		Calorific value
	Degrees Fahrenheit	Pounds.	60° F.	60° F.			B.t.u. per pound	B.t.u. per gallon	B.t.u. per pound	B.t.u. per pound
Methane. CH_4	−259	3.420	0.554	80.6	81,400	1008.4	0.593			23,790
Ethane, C_2H_6	−128	3.716	1.038	46.7	83,000	1763.6	0.506	792	213	22,240
Propane, C_3H_8	− 47.4	4.462	1.523	38.2	96,900	2519	0.475	830	186	21,620
Butane, C_4H_{10}	+ 31.5	4.911	2.007	32.5	106,500	3274	0.458	854	170.8	21,320
Iso-butane—	+ 13.0									
Pentane C_5H_{12}	+ 96.9	5.214	2.491	27.3	110,200	4029	0.448	808	155	21,130
Hexane C_6H_{14}	+156.2	5.519	2.975	24.2	116,000	4784	0.442	790	143	21,010

Table 2.—Showing the temperatures Fahrenheit below which condensation begins (dew points) under 5 and 60 pound gauge pressures for certain individual paraffin hydrocarbons at concentrations of 2 to 12 per cent in water gas ($CO+H_2$).

	2 per cent		4 per cent		6 per cent		8 per cent		10 per cent		12 per cent	
	5 lbs.	60 lbs.	5 lbs.	60 lbs.	5 lbs.	60 lbs.	5 lbs.	60 lbs.	5 lbs.	60 lbs.	5 lbs.	60 lbs.
Methane (CH_4)	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
Ethane (C_2H_6)	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
Propane (C_3H_8)	−100	−100	−100	− 95	−100	− 95	−100	− 80	−100	− 65	−100	− 65
Normal Butane (C_4H_{10})	− 95	− 55	− 80	− 30	− 70	− 20	− 55	− 10	− 50	0	− 40	+ 10
Iso-butane (C_4H_{10})	−100	− 75	− 95	− 50	− 85	− 40	− 75	− 25	− 70	− 10	− 60	− 5
Normal Pentane (C_5H_{12})	0	+ 5	0	+ 32	0	+ 45	+ 5	+ 55	+ 12	+ 65	+ 22	+ 75
Iso-Pentane (C_5H_{12})	− 20	− 10	− 20	+ 20	− 20	+ 30	− 10	+ 40	0	+ 50	+ 10	+ 60

The above figures are based on calculations made with the use of vapor pressure charts and are believed accurate within the limits of accuracy required to illustrate the stability even at low temperatures of a gas such as water gas when enriched with propane, butane or mixtures of the two in amounts required to bring the former up to city gas standards and when the pressure conditions are those normally used in the distribution of city gas. No allowance has been made for solubility effect resulting from the absorption of hydrocarbons by drip condensate which might result when the carbureted gas is mixed with other gases containing condensable matter.

lating to the use of this product for enriching water gas was noted and the lean gas as well as the carbureted gas made was tested.

SOME PROPERTIES OF G. E. GASOLINE

(Propane, butane, and mixtures of the two)

These hydrocarbons belonging to the same chemical series as methane, having the general formula $C_nH_{2n}+2$, have many chemical properties in common with methane and their addition to a lean gas changes the properties and burning characteristics of the gas in the same general direction although to a different extent. The hydrocarbons of this series do not readily enter into chemical reaction with other substances and therefore are incapable of combining with oxygen or polymerizing in the distributing system and thus cannot cause gum and resin troubles commonly met with in the distribution of manufactured gas.

As the number of carbon atoms in the molecule increases, i.e. in proceeding from methane throughout the series, the oxygen requirements for the complete combustion of unit volume of the gases also increases; in other words, the calorific values of these hydrocarbons (as gases) increases from methane. Similarly the specific gravity increases from methane in the same order. In Table 1 are shown some of the physical constants and properties of a few of these hydrocarbons which have bearing on their use for enriching gas.

It will be observed that both propane and butane are gases under normal conditions of temperature and pressure; accordingly it seems most feasible that they be stored under pressure and in the liquid form. Knowledge of the vapor pressures of these hydrocarbons at different temperatures is essential in making estimates relating to the feasibility of storing such products or the influence upon the cost of finished gas. Vapor pressure curves for some of the paraffin hydrocarbons are shown. Calculations have been made showing approximately the temperatures below which condensation would begin when these hydrocarbons are used as enricher in amounts varying from 2 to 12 per cent under pressure conditions varying up to 60 pounds and these data are shown in Table 2.

The calculations and preliminary study of the properties of these hydrocarbons indicated that they could be used satisfactorily for enriching lean gas and that the problem was chiefly a mechanical rather than a chemical problem. Means were developed for uniformly

(Continued on Page 47)

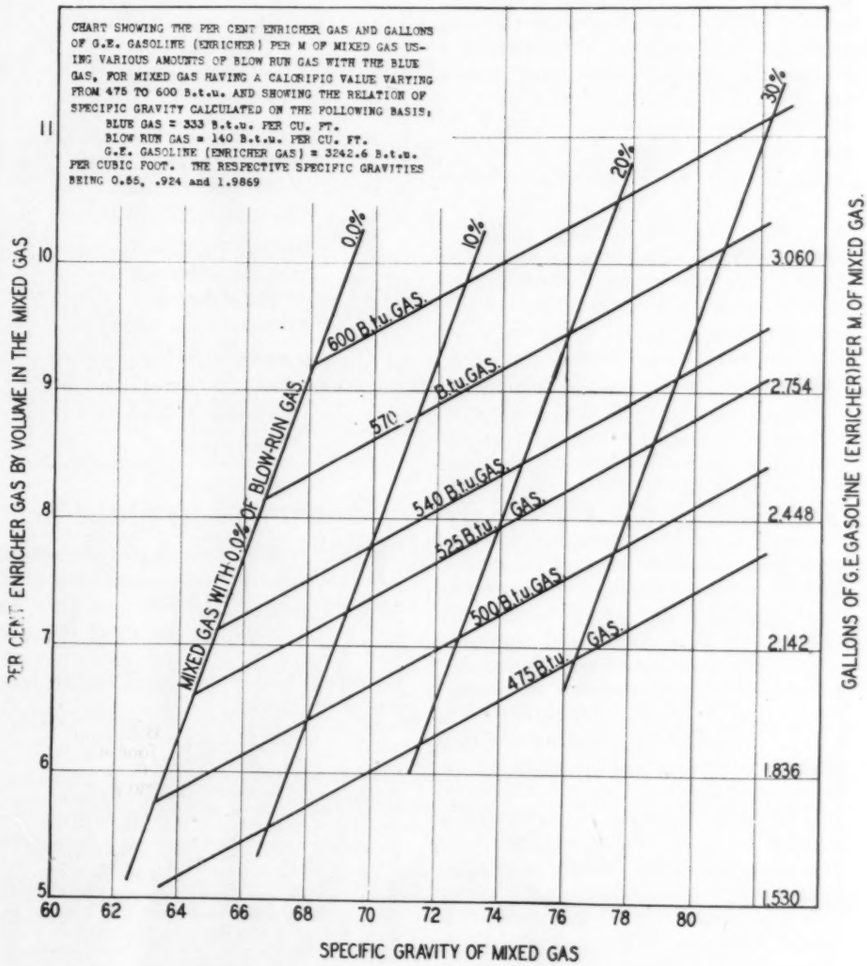
CHART SHOWING THE PER CENT ENRICHER GAS AND GALLONS OF G.E. GASOLINE (ENRICHER) PER M OF MIXED GAS USING VARIOUS AMOUNTS OF BLOW RUN GAS WITH THE BLUE GAS, FOR MIXED GAS HAVING A CALORIFIC VALUE VARYING FROM 475 TO 600 B.t.u. AND SHOWING THE RELATION OF SPECIFIC GRAVITY CALCULATED ON THE FOLLOWING BASIS:
BLUE GAS = 333 B.t.u. PER CU. FT.
BLOW RUN GAS = 140 B.t.u. PER CU. FT.
G.E. GASOLINE (ENRICHER GAS) = 3242.6 B.t.u. PER CUBIC FOOT. THE RESPECTIVE SPECIFIC GRAVITIES BEING 0.55, .924 and 1.9869
0.0%
10%
20%
30%
600 B.t.u. GAS.
570 B.t.u. GAS.
540 B.t.u. GAS.
525 B.t.u. GAS.
500 B.t.u. GAS.
475 B.t.u. GAS.
MIXED GAS WITH 0.0% OF BLOW-RUN GAS.
PER CENT ENRICHER GAS BY VOLUME IN THE MIXED GAS
GALLONS OF G.E. GASOLINE (ENRICHER) PER M. OF MIXED GAS.
3.060
2.754
2.448
2.142
1.836
1.530
11
10
9
8
7
6
5
60
62
64
66
68
70
72
74
76
78
80
SPECIFIC GRAVITY OF MIXED GAS

Figure 2. 93% butanes; 2% pentanes; 5% propane.

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary

The Lord Helps Those Who Help Themselves

SOME months ago the Association received a letter from a utility company manager in which was described in a most heart rending manner the difficult lot of the gas man in the Pacific Northwest. Through the tears which blurred our vision we read at the close of the letter a plea that perhaps the Association could do something or suggest something which would make it possible to sell gas in a country where electricity is given away and the only price paid for cord wood is the backache developed in handling it.

This letter worried us and we have never ceased to grieve over our inability to offer a solution. The picture has haunted us—the haggard gas man going ceaselessly from door to door seeking in vain for business, the crumbling gas works, the rusting mains, how sad is poverty and dissolution after a prosperous and honorable career! Can it be true that gas is doomed?

Readers are perhaps expecting a happy ending! Alas, no, this is not a movie. The wolf still howls at the door, the cold breath of Death comes closer and closer. The only reason for telling this harrowing tale is to report that the disease is not what it first appeared to be. We have had another letter!

Those who have had the privilege of attending meetings of the Association and hearing the sales managers of gas companies in the Northwest talk about their work, know that they have a difficult problem. But we know, too, that the problem is being met squarely and with a considerable measure of success. In fact, we cannot escape the conviction that if gas sales were everywhere carried on with the intelligence and vigor displayed by some of our Pacific Northwest companies, load curves everywhere would look much different than they do today. These sales managers know their stuff and we like to have them on our committees.

The sales manager of our poverty-stricken company was asked to serve this year on a committee dealing with appliance selling. Our latest report is from this sales manager and it reveals an inherent weakness which may well be the reason for the severe ravages caused by competition. He is unable to act on the committee because, "Our efforts here are mainly in selling electric appliances. We do have the gas in the city, but we are doing very little along the gas line as our mains do not extend out in the residential district."

At least our months of grief have not been wasted. The picture has merely changed. Instead of honorable old age working bravely for a living, we have a neglected step-child expected to work without food or tools. Our simple faith in gas has been restored, but the picture it pitiable nevertheless. We shall continue to grieve.

ASSOCIATION CALENDAR

SOUTHERN REGIONAL CONFERENCE
Los Angeles
February 23-25, 1928

JOINT MEETING WITH ARIZONA UTILITIES ASSOCIATION
Prescott, Arizona
April 26 and 27, 1928

NORTHERN REGIONAL CONFERENCE
Vancouver, B. C.
May or June, 1928

35TH ANNUAL CONVENTION
Hotel Coronado, Coronado, Calif.
September 17-20, 1928

Committees Are at Work

THE tremendous job of organizing and instructing committees is almost complete. The lists published below are proof of the energy of our Section Chairmen and evidence that the Coronado Convention will not be lacking in educational value.

GENERAL COMMITTEES

Rate Structures

B. B. Beckett, Chairman, Pacific Gas and Elec. Co.
F. M. Banks, Southern California Gas Co.
H. R. Basford, H. R. Basford Co.
A. F. Bridge, Southern Counties Gas Co.
R. U. Fitting, Los Angeles Gas and Electric Corp.
L. F. Galbraith, Pacific Gas and Electric Co.
R. A. Hornby, Southern California Gas Co.
A. E. Holloway, San Diego Cons. G. and E. Co.
W. T. Neill, Portland Gas and Coke Co.
J. F. Pollard, Coast Valleys Gas and Elec. Co.
J. T. Ryan, Pacific Gas and Electric Co.
E. H. Wetlaufer, Southern California Gas Co.

Gas Engineers Handbook

R. M. McCalley, Chairman, Portland G. and C. Co.
A. F. Bridge, Southern Counties Gas Co.
C. Johnstone, Pacific Coast Gas Association.
L. M. Klauber, San Diego Cons. G. & E. Co.
H. L. Masser, Los Angeles Gas and Elec. Corp.
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C. A. Isbell, Southern Counties Gas Co.
C. L. Murphy, South Coast Gas Co.
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Bi-Monthly Billing

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J. H. Eason, Los Angeles Gas and Electric Corp.
O. A. Honey, Southern Counties Gas Co.
E. H. Wetlaufer, Southern California Gas Co.

Financial and Operating Reports

N. H. Bradshaw, Chairman, L. A. G. and E. Corp.
J. P. Case, Southern California Gas Co.
A. T. Kelly, Pacific Gas and Electric Co.
W. J. McCoy, Southern Counties Gas Co.
R. S. McNamee, Coast Counties Gas and Elec. Co.

Statistics

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L. R. French, Southern California Gas Co.
L. D. Romig, San Diego Cons. Gas and Elec. Co.
W. A. Worthington, Pacific Gas and Electric Co.

Undistributed Costs and Fixed Capital Ledger

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C. D. Cushman, Los Angeles Gas and Elec. Co.
O. A. Honey, Southern Counties Gas Co.
C. C. May, San Diego Cons. Gas and Elec. Co.
M. J. Wilkinson, Pacific Power & Light Co.

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C. H. Potter, Vice-Chairman, Southern Counties Gas Co.

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N. H. King, Southern Counties Gas Co.
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H. E. Seagraves, Tacoma Gas and Fuel Co.
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Frank Weiss, Los Angeles Gas and Elec. Corp.

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H. W. Elder, San Diego Cons. Gas and Elec. Co.
R. E. Farrand, Coast Counties G. and E. Co.
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J. Fremont, British Columbia Elec. Ry. Co., Ltd.
O. R. C. Grow, Southern Counties Gas Co.
John B. Redd, Los Angeles Gas and Elec. Corp.
A. A. Salmon, Spokane Gas and Fuel Co.
H. E. Seagraves, Tacoma Gas and Fuel Co.

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Chas. L. Ferry, Southern Counties Gas Co.
Dozier Finley, Paraffine Companies, Inc.

W. L. Hoyt, American Gas Products Corp.
Wm. A. Moore, Spokane Gas and Fuel Co.
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W. S. Dicken, Puget Sound Power and Light Co.
Mrs. A. V. Farnsworth, Pac. Gas and Elec. Co.
P. S. George, Coast Valleys Gas and Electric Co.
Miss Margaret Hanna, Southern Counties Gas Co.
Miss Ella M. Lehr, Pacific Gas and Electric Co.
Mrs. D. R. Withers, Pacific Gas and Electric Co.

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J. R. Geddes, Pacific Gas and Electric Co.
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E. B. Morey, Southern Counties Gas Co.
R. J. Phillips, San Diego Cons. Gas and Elec. Co.
C. M. Robert, Los Angeles Gas and Electric Corp.

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L. J. Brundige, Pacific Gas and Electric Co.
O. S. Clifford, Truckee River Power Co.
H. S. Furlong, Pacific Gas and Electric Co.
J. C. Gilbert, Southern Counties Gas Co.
O. R. C. Grow, Southern Counties Gas Co.
J. H. Hartog, Portland Gas and Coke Co.
W. E. Keefe, Southern Counties Gas Co.
E. W. Kimmell, Pacific Gas and Electric Co.
W. J. Lane, Turlock Gas Co.
H. Lenninger, Pacific Gas and Electric Co.
N. R. McKee, Southern Counties Gas Co.
V. H. Moon, Pacific Power & Light Co.
L. G. Moore, Southern Counties Gas Co.
John S. C. Ross, Pacific Gas and Electric Co.
C. E. Rutledge, Southern Counties Gas Co.
G. W. Smith, Southern Counties Gas Co.
E. A. Stowe, South Coast Gas Co.
A. P. Stryker, Pacific Gas and Electric Co.
Frank Talcott, Pacific Gas and Electric Co.
Ray Trowbridge, Pacific Gas and Electric Co.

Radio Broadcasting

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A. L. Adkins, Pacific Gas and Electric Co.
O. R. C. Grow, Southern Counties Gas Co.
N. H. King, Southern Counties Gas Co.
E. P. Ramsey, Los Angeles Gas and Electric Corp.
Forrest Raymond, San Diego Cons. G. and E. Co.
Lawrence Raymond, Southern Counties Gas Co.
C. F. Rutledge, Southern Counties Gas Co.
M. F. Wales, Coast Counties Gas and Elec. Co.

Current Public Relations Literature

J. C. Jordan, Reviewer, Pac. Gas and Elec. Co.

Employee Contacts

W. H. Barton, Chairman, Portland G. and C. Co.
H. W. Beekman, Pacific Gas and Electric Co.

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J. F. Pollard, Coast Valleys Gas and Electric Co.

Legislation and Taxation

Geo. L. Myers, Chairman, Pacific P. and L. Co.
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D. C. Murphy, Southern California Gas Co.
S. C. Schwarz, Portland Gas and Coke Co.
Duncan Stewart, Pacific Gas and Electric Co.
J. T. Sullivan, Truckee River Power Co.
C. E. White, San Diego Cons. G. and E. Co.

Customers' Service

A. R. Bailey, Chairman, Los Angeles G. and E.
Eugene Boose, Southern California Gas Co.
W. F. Brandt, Los Angeles Gas and Elec. Corp.
E. G. Campbell, Pacific Gas and Electric Co.
Robertson Cook, Portland Gas and Coke Co.
G. F. Cruickshank, Southern Counties Gas Co.
Geo. Wehrle, Public Service Co. of Colorado.

Domestic Gas Meter and Regulator Installation and Operation

D. H. Perkins, Chairman, San Diego Cons. Gas and Electric Co.
A. R. Bailey, Los Angeles Gas and Electric Corp.
W. L. Haynes, Southern Counties Gas Co.
W. L. McKee, Southern Counties Gas Company.

Gas Measurements

F. A. Hough, Chairman, Southern Counties Gas Co.
R. M. Bauer, Southern California Gas Co.
M. J. Cereghino, Los Angeles Gas and Elec. Corp.
R. L. Cook, Southern California Gas Co.
L. P. W. De Brisay, Los Angeles G. and E. Corp.
L. W. Jillson, Southern California Gas Co.
B. M. Laulhere, Southern California Gas Co.
A. E. Madden, Southern Counties Gas Co.
G. B. Reece, Southern Counties Gas Co.
T. K. M. Smith, Industrial Fuel Supply Co.
M. Levering, Southern California Gas Co.

Gas Oil Specifications

F. C. Jones, Chairman, Pacific G. and E. Co.
Guy Corfield, Los Angeles Gas and Elec. Corp.
F. M. Cota, San Diego Cons. Gas and Elec. Co.
S. C. Schwarz, Portland Gas and Coke Co.

Load Factors

W. M. Henderson, Chairman, L. A. G. and E.
C. G. Fiscus, Western States Gas and Elec. Co.
W. L. H. Geldert, Southern Counties Gas Co.
Otto Goldkamp, San Diego Cons. G. and E. Co.
V. W. Harper, Portland Gas and Coke Co.
N. L. Hoff, Los Angeles Gas and Electric Corp.
W. F. Page, Pacific Gas and Electric Co.
S. C. Singer, Southern California Gas Co.

Materials and Methods

Otto Goldkamp, Chairman, San Diego Cons. Gas and Electric Co.
A. R. Bailey, Los Angeles Gas and Electric Corp.
C. F. Creelman, San Diego Cons. G. and E. Co.
M. Levering, Southern California Gas Co.
Wm. de Waard, San Diego Cons. G. and E. Co.
E. T. Floyd, Pacific Gas and Electric Co.
Lee Holtz, Southern California Gas Co.
Geo. Knox, Southern California Gas Co.
B. F. McBurney, Southern California Gas Co.
Ralph Phillips, San Diego Cons. G. and E. Co.
R. C. Boughton, Los Angeles G. and E. Corp.

Soil Corrosion of Gas Lines

Dozier Finley, Chairman, Paraffine Companies, Inc.
E. P. Bly, Standard Oil Co.
R. C. Boughton, Los Angeles Gas and Elec. Corp.
R. S. Fuller, Pacific Gas and Electric Co.
M. E. Waite, San Diego Cons. Gas and Elec. Co.

Water Gas Manufacture on the Pacific Coast

Frank Wills, Chairman, Pacific G. and E. Co.
J. J. Ferrari, Puget Sound Power and Light Co.
F. C. Hawks, Tacoma Gas and Fuel Co.
J. F. Sauer, Pacific Gas and Electric Co.

Symposium on Operation

J. E. Kelley, Chairman, Pacific G. and E. Co.

Technical committees with personnel not yet complete, are as follows:

Internal Pipe Corrosion. Dust Control and Dehydration of Gas

H. M. Barnes, Chairman, San Diego Cons. Gas and Electric Co.

Mechanical Equipment for Field Construction Work

R. V. Wilson, Chairman, Pacific Gas and Elec. Co.

Oil Gas Generator Operation and Refractories

R. R. Ripley, Chairman, Portland Gas and Coke Co.

Safety Education and Methods

J. R. Rowe, Chairman, Los Angeles G. and E. Corp.

Unaccounted for Gas

R. C. Boughton, Chairman, L. A. G. and E. Corp

ARIZONA CONVENTION

W. C. Hornberger, president of the Arizona Utilities Association, announces that the 1928 convention will take place at Prescott, on April 26 and 27. As has been the case at the past two conventions, members of the Pacific Coast Gas Association will take a prominent part in the program. The Arizona meetings have a reputation of being very enjoyable and worthwhile affairs and the usual large attendance from the Coast can be expected at Prescott. Milton G. Sanders is Executive Secretary of the Arizona Utilities Association, with offices in the Industrial Congress Bldg., Phoenix, Ariz.

Sales Conference Planned for Headline Attraction

BIG things are in store for commercial men at the Los Angeles meeting, February 23 to 25. A special Sales Conference, under the joint auspices of the P.C.G.A. and the American Gas Association, is proposed in connection with this meeting, and details are given in the following letter addressed in December by C. R. Miller, chairman of the association's Commercial Section, to Pacific Coast commercial department executives:

December 27, 1927.

Mr. John Doe,
Manager of New Business,
Blank Gas Company,
Blank, Any Pacific Coast State

My Dear Mr. Doe:

Optimism as to the future of the Gas Industry, seems to be in the air, and that it originates in the sales departments of our progressive gas companies, should be susceptible to proof. Let us either prove or disprove it.

The Pacific Coast Gas Industry has achieved national and international recognition through the activities of the engineers who contribute to the work of our Technical Section, but the Commercial Section has not as yet earned this distinction. This is not because our sales personnel is inferior to that in other parts of the country, because we know among ourselves that nowhere else must gas be sold so intensively, nowhere else has househeating reached such a development and, considering our small opportunities, our industrial sales compare favorably with those of eastern companies. The probable reason for the comparative lack of prestige of our Commercial Section, lies in the fact that the Association was for years largely a technical organization and our salesmen do not yet fully realize the benefits to be gained by an interchange of ideas.

We do not want to wait until another convention to prove the value of our sales work, but propose to hold a special Sales Conference in connection with our Los Angeles meeting, February 23 to 25. This sales conference will be jointly sponsored by the American Gas Association and the Pacific Coast Gas Association and the purpose of it will be to tell the world and each other what we are doing in the matter of load building.

(Continued on Page 58)

EDITORIAL

Research on Rates

IN LINE with the now generally recognized need for bringing gas rate structures into closer conformance to conditions of demand and service the Pacific Coast Gas Association has appointed a general committee on rate structures, and a report from this group will be submitted at the association's 1928 convention.

The new committee is a well rounded body. The engineer and the accountant are there, and so are the company executive and the new business department representative. In too many instances rate research work fails to accomplish its purposes because the men who are entrusted with the task of putting on new load are the last to be consulted, if their voices are heard at all.

Gas salesmanship is subject to the same limiting conditions which affect the sale of other commodities. In every industrial use, and equally so in the domestic field, there is a rate line above which gas will not sell. Conversely, there is a line below which it cannot be sold at a profit. The new business department is just as obviously the source to consult in the first instance, as is the engineer-accountant in the second.

On this matter of fixing rates to get the business Samuel Insull, president of the Peoples Gas Light and Coke Company, speaking before the last annual convention of the American Gas Association offered it as his opinion that we too often take a wrong mental attitude toward new business. Instead of taking the passive stand that certain classes of business are not on the gas horizon because we have no rate low enough to get them, we should rather approach the problem, says Mr. Insull, by first determining "whether the business is one for which gas is properly useable; and if it is, then set about making a rate that will get the business at a profit."

A Case Where Our Manufacturers Lead

EVERY now and again some pessimist of the industry raises his head long enough to set up an opinion that the appliance manufacturing branch of the gas family has failed to realize on its possibilities.

Those pessimistically inclined will perforce take a more favorable view of the situation in the light of announcements from two of the industry's range manufacturers. Color harmony in kitchen ranges! What appeal could have greater force in the better class of home! In bringing out a line of gas ranges in varied colors, ahead of competitive fuel range makers, these manufacturers have rendered the industry a service of tremendous value. They have emphatically placed the range even more closely in step with modern decorative demands, and they have to this extent enabled the gas industry to lead, not follow.

These new lines, stimulating replacements and new sales, will result in more dealer effort. They should also be pushed by gas company new business departments, both for the sake of getting high class appliances out on the lines, and as an encouragement to the manufacturers to persever in originating merchandise of modern appeal.

Gas refrigeration—colored ranges—what will be the next development on the "romance" side of our industry?

More Uses for Natural Gasoline

NATURAL gasoline has always been at least a first cousin of the gas industry, through its close relation to natural gas. Now comes word that by-products of natural gasoline manufacture, propane and butane, which hitherto have been wasted for lack of a market, may be used with excellent results for the enrichment of water gas. This conservation measure has been the subject of a Bureau of Mines investigation, reported upon in this issue of *Western Gas*.

It is likely, says the Bureau report, that these natural gasoline by-products will be produced in greater quantity in the future because of more general use of oil cracking processes in gasoline manufacture. The possibility of marketing these propane, butane and similar fractions to the artificial gas industry might become an important factor in the natural gasoline manufacturer's margin of profit—which is becoming increasingly lean. Another move in the direction of greater profits is the natural gasoline operator's research in recovery of industrial chemical materials, chiefly solvents; in production of "stove gas"—propane-butane mixtures which can be bottled under pressure and used as domestic appliance fuel off the gas lines; and in developing other special fuels.

We Cannot Afford *to* Neglect *the* Domestic Field

By L. J. BRUNDIGE
Pacific Gas and Electric Company

ONLY in very recent time have gas companies begun to recognize the seriousness of the decreasing consumption per individual gas user situation—a problem which is felt to some degree in a big percentage of companies. The paper below outlines general aspects of this situation on the Pacific Coast on the basis of data compiled by the Pacific Coast Gas Association Domestic Gas Sales Committee, of which the author is chairman. His report was given at the 1927 convention of the association. Outstanding among the facts presented are those which demonstrate the potential market for domestic gas appliances on existing gas lines.

IT is only right that a great amount of time and effort should be devoted to a discussion of the promotion of the use of gas for domestic purposes for the reason that the domestic business is the backbone of the industry. In reviewing the reports on previous Conventions, however, it appears that very little scientific study has been given to this phase of our work.

Is not the domestic side of our business worthy of as detailed an analysis as, for example, the study that has been made of the application of gas to industrial purposes?

What are the things your Board of Directors or your General Manager consider when it comes time to appropriate money for sales purposes? Do they think so much about the compensation of salesmen, or the number of water heaters you expect to sell? No. They consider first what the effect of your sales activity has been on the consumption per consumer in the territory which you are covering, and secondly, what the effect of these activities has been on the revenue per dollar invested. In making our study therefore we should keep these two points in mind.

In order to make a proper analysis of conditions as they exist on the Pacific Coast it is essential that surveys be conducted to obtain data on which to base our study. In attempting to compile charts and curves showing the percentage of the various types of gas equipment in use by our consumers, we found that there was a lack of standardization in surveys that had been made by various gas companies. We also found that average figures did not mean a great deal for the reason that local climatic conditions affected the percentage of different types of appliances in use. For example—in Los Angeles we did not find as many combination gas-coal and wood ranges in use as in Portland.

The following charts and comments will illustrate what we recommend as a means of analysis of conditions as they exist in various gas consuming territories.

The trend in consumption per consumer is the acid test of the effectiveness of any sales activity. New consumers may be added but if creative sales activities are not carried on to bring about an increase in consumption per consumer, something is lacking in the sales program.

Chart No. 1 is an example of what is meant by "Trend in Consumption per Consumer." This chart is based on a study of the trend in consumption per consumer in a city of 125,000 consumers. The average monthly consumption per consumer for the year 1926 in this city was 3,642 cu. ft.

The vertical axis on the chart indicates increase in average monthly consumption. The horizontal axis indicates the year.

In 1924 you will note that the increase in average monthly consumption per consumer is 104 cu. ft. In 1925 it dropped to 88 cu. ft. and in 1926 to 36 cu. ft. During this period of three years there was of course, an increase in consumption per consumer. The amount of increase, however, is growing less every year.

What will the situation be in this city in 1930 if this condition continues? If the increase in consumption per consumer is gradually reduced to zero, eventually there will be a decrease in consumption per consumer.

The chart indicates that there are forces at work tending to cut down the normal increase in consumption per consumer brought about through sales activity, or, you might say, the increase in consumption per consumer has been allowed to decrease due to a lack of creative sales activity.

In discussing Chart No. 1, it was stated that there are forces at work tending to reduce the normal increase in consumption per consumer. What

(Continued on Page 63)

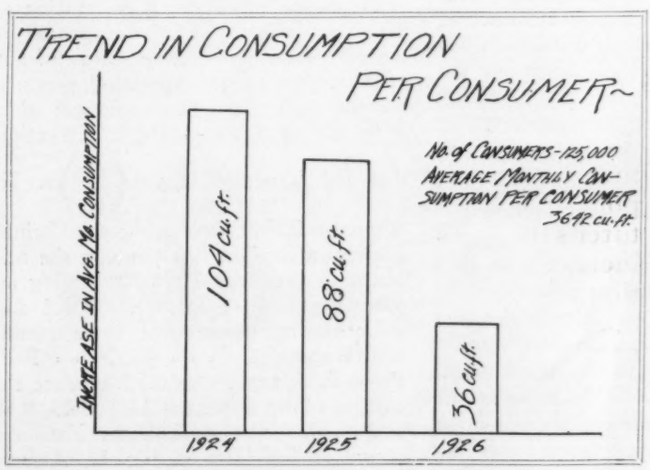


Chart No. 1

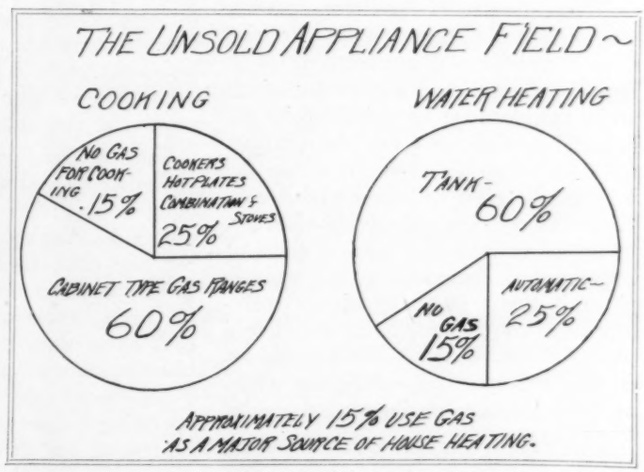

THE UNSOLD APPLIANCE FIELD~
COOKING
No Gas for Cooking .15%
Cookers Hotplates Combination & Stoves 25%
Cabinet Type Gas Ranges 60%
WATER HEATING
Tank- 60%
No Gas 15%
Automatic- 25%
Approximately 15% use Gas as a Major Source of House Heating.

Chart No. 2

Oil Absorption *of* Natural Gasoline

By W. K. LEWIS

¶ Presented as a contribution from the Department of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, Mass., before the December 5-8 meeting of the American Institute of Chemical Engineers at St. Louis, this paper by W. K. Lewis occasioned a great deal of interest among natural gasoline men present.

A METHOD of computation[1] of continuous countercurrent absorption systems for the absorption of any single component in a gaseous mixture by a non-volatile liquid absorbent in which the other component or components of the gas are substantially insoluble has recently been devoloped. This method not only simplifies the computations necessary in the design of equipment and the testing of operating plants, but makes it easy to visualize clearly what is taking place in the process. It is the purpose of this article to expand the application of this method of computation to solve the more complicated problems met in the absorption of the large number of components present in natural gasoline.

For the sake of clarity it is desirable to consider first a system in which one is absorbing a single soluble component. Thus, assume a mixture of butane and methane, in which one is dissolving the butane by countercurrent flow of absorbent oil. Express the concentration of butane in the gas as mols of butane per mol of methane, calling this ratio y. Similarly, the concentration of butane in the liquid, x, is expressed as mols of butane per mol of absorbent. Call the mols of methane passing through the absorption system per unit time G, and the mols of absorbent oil L. It will be clear that any butane given up by the gas must be picked up by the liquid, i.e., $Gdy = Ldx$. Integrating, $G(y_0 - y) = L(x_0 - x)$, where the subscript 0 refers to concentration conditions at the rich end of the absorber. This means that the concentration of butane, thus expressed, in the gaseous phase is linear in terms of the corresponding concentration in the liquid phase. This equation, representing as it does the operating conditions which must of necessity obtain at every point in the absorber, may be referred to as the operating line. Since this equation represents nothing but equality of input to output of butane, its validity cannot be questioned if one grants the operating conditions assumed in its derivation. It should be noted that the slope of this line is L/G, the ratio of absorbing liquid to inert gas submitted to treatment. It follows, therefore, that if one knows this liquid-gas ratio, a single point on the operating line determines the operating conditions throughout the absorber.

Since at every point in a continuously operating absorption unit conditions must be such that positive absorption is taking place, it is clear that the operating line must at all points lie on that side of the equilibrium curve corresponding to higher concentrations in the gaseous phase than the equivalent equilibrium concentrations in the liquid phase. Furthermore, the distance between the operating line and the equilibrium curve represents the driving force producing absorption and is therefore a quantitative measure of the rate of absorption in the unit.

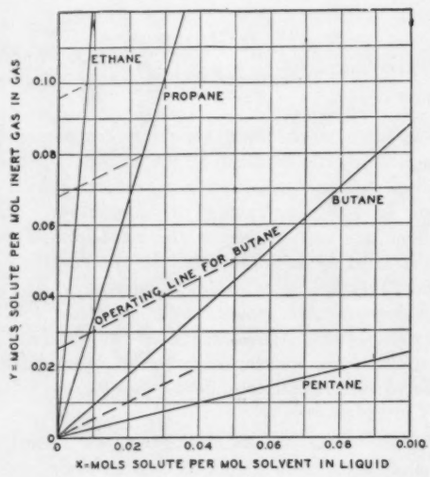


Figure 1

TABLE I

Component	Raw gas composition	p(atm.)	P	Mol % (calc.)	Mol % (actually in liquid)	% saturation	Entering raw gas (CH_4+ basis)	Exit raw gas (CH_4+ basis)	Mols per mol G. O. at equilibrium
CH_4 +.....	68.5	2.179	—	—	1.0	—	—	—	—
C_2H_6.....	11.9	0.378	51	0.74	0.7	95	17.4	17.0	0.89
C_3H_8.....	10.0	0.318	12.7	2.5	2.15	86	14.6	13.4	3.0
Iso-butane....	1.8	0.057	5.0	1.14	1.15	101	2.6	2.0	1.37
Butane.....	4.2	0.134	3.4	3.94	3.7	94	6.1	4.0	4.74
C_5H_{12}.....	2.1	0.067	0.95	7.0	4.1	59	3.1	0.9	8.4
C_6H_{14} +.....	1.5	0.047	0.097	49.	4.1	8	2.2	—	59.
	100.0				16 9				

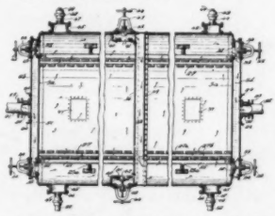
Take for the moment the absorption of a lean gas. Call the partial pressure of the component under consideration p, the vapor pressure of this component in the pure state at the temperature of absorption P, and the operating pressure on the unit P_1. It is obvious that $p = Px = y(P_1 - P_0p)$. Granting that P_0p is negligible, $y = \left(\frac{P}{P_1}\right)x$. In other words, in this case, the equilibrium curve is a straight line through the origin with the slope P/P_1 Assuming an operating temperature of 300° K., and an operating pressure of three atmospheres absolute, $P_2 = 43$, $P_3 = 10.3$, $P_4 = 2.63$, and $P_5 = 0.72$, whence the corresponding slopes are 14.3, 3.43, 0.88 and 0.24. The equilibrium lines are shown as full lines on Fig. 1. Assume

(Continued on Page 49)

1. Principles of Chemical Engineering, Walker, Lewis and McAdams, second edition, 1927, McGraw-Hill Book Co., Inc., pp. 675 et seq.

THIS MONTH'S PATENTS PERTAINING TO THE INDUSTRY

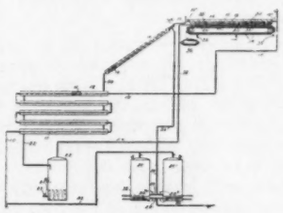
1,632,457. GAS-PURIFYING APPARATUS. CHARLES I TENNEY, Ames, Iowa, and PAUL W THAYER, Minneapolis, Minn., said Thayer assignor to American Gas Construction Company, Newton, Iowa, a Corporation of Iowa. Filed Aug. 28, 1925. Serial No. 53,170. 12 Claims. (Cl. 183—46.)



1. A gas purifying apparatus having in combination, a cylindrical casing, trays extending across a chord of said casing, said trays comprising spaced series of spaced slats adapted to support gas purifying material, the openings between adjacent slats in one series being staggered with the spaces between adjacent slats in the other series and means for rotating said casing to reverse the position of said purifying material.

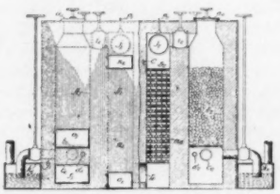
1,633,071. METHOD OF PRODUCING CARBON BLACK. LEWIS J. DALES, Mount Vernon, N. Y. Filed Apr. 4, 1921, Serial No. 458,370. Renewed Aug. 27, 1924. 13 Claims. (Cl. 134—60.)

13. The method of producing carbon black from natural gas, which comprises taking the raw gas, passing the same through an elongated heating chamber, then through a condenser, utilizing the raw gas as a cooling medium whereby to separate the gas from the condensible hydrocarbons present therein, then conducting the separated gas to a point below said elongated heating chamber and burning said gas whereby to heat the interior of said heating chamber and to form a deposit of carbon black upon the outer surface of said heating



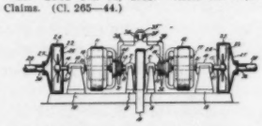
chamber, and finally scraping the carbon deposit from the outer surface of said heating chamber and conveying the same to a point of collection, substantially as specified.

1,652,386. PROCESS OF MAKING MIXED WATER GAS AND COAL GAS. WILLIAM D. WILCOX, Idaho Falls, Idaho. Filed Mar. 20, 1922. Serial No. 545,064. 1 Claim. (Cl. 48—202.)



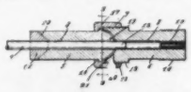
A process for making mixed water gas and coal gas, which comprises; air blasting a fuel bed in one gas generator to incandescence, passing the blast gases into a superheater, having a baffle wall for conveying the gases downwardly and then upwardly, burning the blast gases therein and thereby heating the superheater, shutting off the air blast and then admitting steam to the base of the incandescent fuel, causing the resultant water gas to pass downwardly and then upwardly through the superheater and thereby superheating the water gas, passing the superheated water gas into the upper part of a second gas generator containing a fuel bed having an upper layer of coal, passing the water gas down through the fuel in the second generator, and thereby distilling the volatiles from the coal, withdrawing the resultant mixed water gas and coal gas from the base of the second gas generator, and periodically reversing the operation of the gas generators.

1,648,098. GAS-DENSITY METER. JACOB W. MCNAIRY, Schenectady, N. Y., assignor, by mesne assignments, to Bailey Meter Company, a Corporation of Delaware. Filed Oct. 31, 1925. Serial No. 66,088. 7 Claims. (Cl. 265—44.)



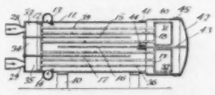
1. In a gas density meter, the combination of a pair of gas accelerating impellers, means providing a common source of power for driving said impellers, a pair of dynamo-electric machines through which the impellers are separately driven from said source of power, and electrical indicating means in circuit with said machines for indicating the difference in electrical energy transmitted through said machines as a measure of the difference of the torque required to drive the impellers and the difference in the densities of gases accelerated by said impellers.

1,649,673. GAS-LINE COUPLING. HERBERT F. DYCK, Ness City, Kans. Filed Dec. 30, 1926. Serial No. 158,009. 4 Claims. (Cl. 285—122.)



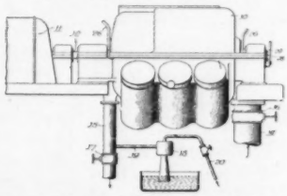
1. In a coupling of the character described, a male member having a substantially semi-spherical shaped head at one end and a recess in its other end, a female member having a seat correspondingly shaped to the head for receiving the same, a pipe section passed centrally through the male member and having one end projected beyond the head to telescope within the female member, adhering means within the recess in the male member for securing the pipe section therein, and means loosely carried by the male member and engageable with the female member to lock said members together.

1,648,646. HEAT EXCHANGER. JULIUS E. KOBERMIX, Fullerton, Calif., assignor to Newton Process Manufacturing Co., Fullerton, Calif., a Corporation of California. Filed June 22, 1926. Serial No. 117,711. 6 Claims. (Cl. 257—240.)



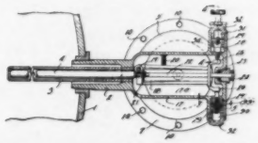
1. A device of the class described comprising a shell, heads for the shell, means providing three stationary chambers in the shell adjacent one end, means providing two movable chambers in the shell adjacent the other end, tubes connecting two of the stationary chambers to their respective movable chambers, tubes connecting both movables chambers to the third stationary chamber, means providing an inlet and an outlet for the space in the shell about the tubes, means providing an inlet leading to one of the stationary chambers, and means providing an outlet leading from another stationary chamber.

1,652,747. COMPRESSOR APPARATUS. WILLEM VAN RITSWIJK, Ennetbaden, Switzerland, assignor to Aktiengesellschaft Brown, Boveri & Cie., Baden, Switzerland, a Joint Stock Company of Switzerland. Filed Aug. 18, 1926, Serial No. 129,966, and in Germany July 2, 1925. 9 Claims. (Cl. 230—202.)



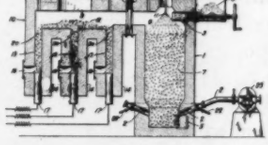
1. The combination with a gas compressor having a casing enclosing a rotor with its drive shaft passing through the casing, of an adjustable gland for forming a seal between the shaft and casing to prevent ingress of atmosphere, and means for exhausting contained gases from the casing while the rotor is stationary.

1,648,910. THERMOSTATICALLY-CONTROLLED GAS VALVE. CLARENCE H. MORROW, Cleveland, Ohio, assignor to The Hotstream Heater Company, Cleveland, Ohio, a Corporation of Ohio. Filed Oct. 20, 1924. Serial No. 744,784. 7 Claims. (Cl. 236—80.)



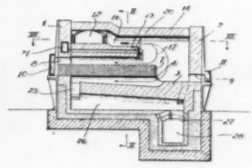
1. Thermostatic gas valve mechanism, comprising a casing provided with opposed chambers separated by a movable abutment, a valve in one of said chambers arranged to be operated by said abutment and controlling the flow of gas from its chamber to a burner, and a thermostatic element and mechanism controlled thereby for controlling movement of said abutment, both said element and mechanism being located in one of said chambers.

1,649,640. PROCESS OF GAS MANUFACTURE. WILLIS STUART YARD and EARL NEWMAN PERCY, Oakland, Calif. Filed Feb. 4, 1924. Serial No. 690,394. 2 Claims. (Cl. 48—200.)



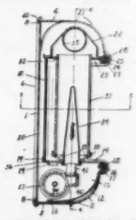
1. A method of manufacturing a gas suitable for domestic use from hydrocarbons, which consists of continuously air blasting a bed of ignited carbon to incandescence in a gas producer, continuously injecting oil onto the bed to cause decomposition of the oil, fixing the gases by passing the gases from the producer through a foraminous mass of incandescent carbon, adding oil to the last-named mass to enrich the gases, and maintaining said foraminous mass of carbon incandescent by the passing of electric current therethrough.

1,649,648. FURNACE. HEINRICH BANGERT, Dusseldorf, Germany. Filed June 9, 1926. Serial No. 114,660. 4 Claims. (Cl. 263—6.)



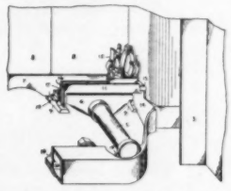
1. A continuous heating furnace having a charging and a discharging end and a top and bottom, a wall below the furnace top extending from the charging toward the discharging end of the furnace, a fuel gas inlet adjacent to the charging end of the furnace and above said wall, and passageways extending longitudinally through said wall for supplying heated auxiliary air to the fuel gas adjacent to the discharging end of the furnace.

1,647,995. GAS HEATING STOVE. HUBERT R. HUMPHREY, Kalamazoo, Mich., assignor to General Gas Light Company, Kalamazoo, Mich. Filed Jan. 21, 1926. Serial No. 82,734. 20 Claims. (Cl. 126—92.)



20. In a structure of the class described, the combination of a casing, a base plate disposed within said casing, a flue, chimneys disposed with their upper ends opening to said flue, said flue being closed to said casing, radiating elements within said chimneys, and a burner disposed in coacting relation to said radiating elements.

1,648,035. GAS HEATER. CLARENCE J. WALTEMADE, New York, N. Y. Filed Mar. 22, 1926. Serial No. 96,392. 3 Claims. (Cl. 126—92.)

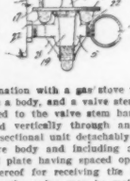


1. In combination with a heater of the class described, a radiant support across the heater back of the burners thereof, a grill support substantially parallel therewith and in front of said radiant support, means for supporting burner heads between said supports, and an abutment at the back of said grill support for preventing the forward shifting of said burner heads.

1,648,329. GAS BURNER. CHARLES W. SIEVERT, Los Angeles, Calif. Filed Feb. 2, 1926. Serial No. 85,435. 3 Claims. (Cl. 158—116.)

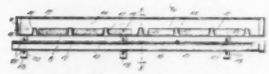
1. A gas burner including in combination a base plate with a circular air aperture and a web crossing below the aperture, an upstanding cylindrical nozzle mounted centrally on the web, the nozzle standing centrally in and above the aperture, a circular flange on the upper face of the base plate around the air aperture, an open bottom cone shaped cup resting on the plate within the flange, the nozzle having gas orifices placed to deliver gas jets in a conical surface above the cup, but at an angle more nearly horizontal than that of the cup's conical surface, the base plate having a series of air holes arranged in circular formation outside the flange and below the outer cup edge, and a rotatable perforated control ring resting on the base plate over said holes and surrounding the flange.

1,652,916. GAS-STOVE VALVE-LOCKING DEVICE. EMILE N. TROTTIER, North Adams, Mass. Filed Jan. 11, 1927. Serial No. 160,409. 4 Claims. (Cl. 251—166.)



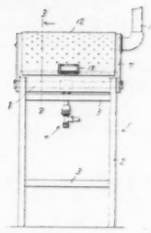
4. In combination with a gas stove valve, wherein the latter includes a body, and a valve stem handle, a clamp rigidly attached to the valve stem handle, an elongated screw threaded vertically through an opening in said clamp, and a sectional unit detachably rigidly associated with the valve body and including a horizontally arranged curved plate having spaced openings throughout the length thereof for receiving the lower end of the screw whereby the valve may be maintained locked in predetermined position.

1,641,888. GAS BURNER. HENRY HOLLEMAN, Smackover, Ark. Filed June 1, 1926. Serial No. 113,692. 9 Claims. (Cl. 158—106.)



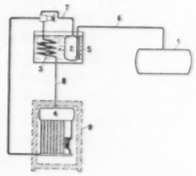
1. A gas burner comprising an elongated trough-like body having spaced air and gas inlets in its bottom, an elongated baffle supported at the top of said body and spaced from the side wall thereof to provide an outlet for the mixture of gas and air, said baffle having downwardly projecting flange means within said body to check the discharge of gas and air and insure thorough mixing thereof, said flange means having downwardly projecting leg portions resting on the bottom of the body, and a gas supply pipe under the body having a plurality of discharge orifices in line with said gas and air inlets.

1,632,646. MATRIX SCORCHER. JAMES WILLIAM FITZSIMMONS, Oakland, Calif. Filed Dec. 16, 1926. Serial No. 155,278. 1 Claim. (Cl. 34—18.)



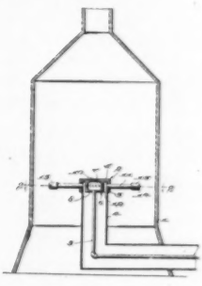
A matrix scorcher comprising a frame, the top of which is dished, a drum seated in and supported by said dished frame top, said drum of circular cross section and having a conduit at its ends for the passage of products of combustion, a burner in the lower portion of the drum, a baffle plate of imperforate character disposed above the burner and having its opposite edges supported on brackets in the drum and spaced from the wall of the drum, and an apertured matrix clamping plate of curved form hinged to and adapted to cooperate with the curved surface of the drum.

1,652,458. REFRIGERATING APPARATUS OF THE ABSORPTION TYPE. ALFRED RICHTER, Dobcritz, near Berlin, Germany, assignor to A.-G. für Hand- und Industriewerte Glarus, Glarus, Switzerland. Filed Feb. 9, 1925, Serial No. 8,024, and in Germany Dec. 14, 1924. 3 Claims. (Cl. 62—118.)



1. Refrigerating apparatus working on the absorption principle, comprising a generator-absorber, a condenser-evaporator, a pipe for return solvent connected to said condenser-evaporator and leading to the generator-absorber, connecting pipes to the condenser-evaporator, a shut-off member for the solvent-returning pipe on the one hand and the connecting pipe to the condenser-evaporator on the other hand, said shut-off member closing in a fluid-tight manner in one end position the connection between the solvent-returning pipe and the generator-absorber and its other end position closing the connection between the condenser-evaporator and the generator-absorber and in all its intermediate positions leaving always open a connection between the generator-absorber on the one hand or the solvent-returning pipe on the other hand and the condenser-evaporator.

1,641,274. GAS BURNER. PAUL C. HUGHES, Tulsa, Okla. Filed Jan. 16, 1926. Serial No. 81,779. 1 Claim. (Cl. 158—104.)



A burner comprising an air chamber, a gas chamber within the air chamber, means for supplying air to the chamber, means for supplying gas to the gas chamber, horizontal burner pipes carried by the gas chamber and having tips, each tip being provided with two outlet orifices, the inner ends of the burner pipes being open and in direct communication with the interior of the air chamber, the gas chamber having jet openings aligning with the burner pipes, whereby the jets issuing from the jet openings entrain the air and carry it into the burner passages, said burner pipes being arranged in circular series and having the outlet orifices of their tips angularly disposed to provide for intersecting jets of combustible fuel, each tip supplying jets that take part in the formation of two flames.

A Manual *for* Gas Appliance Adjustment Workmen

Prepared *for* Service Crews of Los Angeles Gas and Electric Corporation and Used *in* Adjustment Campaign Following Change-Over *to* Natural Gas

THE supervision of the organization and all work performed on the appliance adjustment survey will be under the respective Gas Shops at Los Angeles and Pasadena.

A supervising inspector will have charge of the details and be responsible for the following procedure.

I. SELECTION AND PRELIMINARY TRAINING

a. Only men who are experienced gas appliance men, neat appearing, and possessing a pleasant personality, are selected for this work.

c. These men are trained with complaint men for a period of a week or longer. The length of training depends entirely upon their previous experience in gas appliance work.

II. TOOLS AND EQUIPMENT

a. 1 Employee's Badge
1 Leather tool bag
1 Leather ring book
1 10" pipe wrench
1 8" pipe wrench
1 6" pipe wrench (Crescent)
1 4" pipe wrench (Crescent)
1 2-oz. ball-pein hammer
1 pair thin nose pliers
1 1½" screw driver
1 2½" screw driver
1 small reamer
1 3-corner file
1 Flashlight
1 wire brush
1 extra stove cock
1 Ford valve (for peining cap orifices)
1 book Safety Rules
1 Red and blue pencil
1 swab brush
1 ¾" wooden plug
1 ¾" cap and plug
1 ½" cap and plug
A supply of leather washers.
Pilot tags and wire.
Several extra orifices.
A supply of call notices.
A supply of blank orders.

III. PRELIMINARY INSTRUCTIONS GIVEN BY INSPECTOR TO NEW EMPLOYEES

a. Purpose of Gas Appliance Survey Work.
1. Make a free inspection and adjustment of gas appliances.
2. Foster a spirit of good will and friendship between the consumer and the Corporation.

b. Brief History of Gas Situation in Los Angeles.
1. Manufactured Gas, 850 B.t.u., @ 68c per M.
2. Natural Gas, 1,100 B.t.u. @ 92c per M.

¶In "Western Gas" for December, 1927, there appeared W. M. Henderson's article on "Adjusting Domestic Gas Appliances for Natural Gas Service," describing the recent adjustment campaign of the Los Angeles Gas and Electric Corporation's gas distribution department, of which Mr. Henderson is superintendent. The manual which is published in full on these pages was prepared for the use of the L. A. G. and E. adjustment crews in their huge task of covering the company's system after the introduction of natural gas service. Other companies contemplating domestic appliance adjustment work, even though on smaller scale, will get much value from this manual.

W. M. Henderson

3. The 27 per cent increase in rates to conform with the increase in heat units January 25, 1927, by order of State Railroad Commission.

c. How to answer a number of questions often asked by the consumer.
1. How to explain increased gas bills for last winter.
a. Increased bills during past winter are due primarily to the colder weather for a prolonged period. The Railroad Commission made an investigation in Glendale where natural gas has been served continuously for several years. This past January, the average bill of all consumers was 52 per cent higher than for the previous year. This was due to weather conditions only, as no change had occurred in regard to service.
2. The reasons why the natural gas smokes when appliances are adjusted for manufactured gas.
a. Since the introduction of natural gas, many appliances are burning with a very full flame with yellow tips, which come up around the sides of the utensils and blacken the bottom of same. This condition is due to the fact that the gas range is burning an excess quantity of gas and not sufficient air.

IV. PERSONAL DUTIES AND REQUIREMENTS

a. Present a neat appearance.

b. Be polite and courteous.

c. Always wear Corporation badge in plain view.

d. Turn in a time sheet to the team captain every morning.

e. Report to the team captain at the designated meeting place three times a day, or as otherwise provided.
1. Eight A. M.
2. Twelve noon (when desirable.)
3. Report in the evening between 4:45 and 5 P. M.

f. Turn in all orders to the team captain every night, together with your work sheet.

g. If for any reason you will be late in the morning, or will not report for duty, if working in Los Angeles, phone Los Angeles Gas Shop, VAndike 5716, or if working in Pasadena, phone Pasadena Gas Shop, Terrace 3111, no later than eight A. M. Your team captain will in turn be informed when he reports by phone at 8:00 A. M.

h. If you break a service pipe or a house line and you need immediate assistance, refer to your "Call Notice" where you will find phone number VAndike 5716 if working in Los Angeles, or Terrace 3111 if you are working in the Pasadena district. Report the accident, and the Emergency Car will be sent to you as soon as possible. The telephone number on your "Call Notice" should also be used to report an accident or injury, in which case you are to report where you are and remain there until assistance can be sent to you, unless you receive other instructions from the party who takes your message.

V. METHOD OF PROCEDURE.

a. All calls must be made at the rear door.

b. What to do if no one is at home:
1. Leave a call notice at the front door.
2. The number, size and index of the meter, as well as the time, your name and date, must be noted on your order. The letters "L.N." indicate that you have left a notice. Always note this on your report.
3. If the regulator is not vented, or the meter is broken or sets outside with no box over it, make a note of this under "Remarks."

c. What to do if the house is vacant.
1. The same procedure is followed as on calls, except that call notice is not left, and you report if the meter is turned on or off, or if it has been removed.
2. All vacants are counted as calls on your work sheet.

d. What to say when the party answers the door.
1. Tell them that you are from the Los Angeles Gas and Electric Cor-

poration, and that you have called to make a free inspection and adjustment of the gas range and the heaters, and that such adjustment of appliances is necessary to obtain efficient operation with natural gas.

e. What to say if the party hesitates about admitting you.
   1. Tell her that although she thinks all of the appliances have been adjusted O. K., she should at least permit you to make an inspection.

f. How to answer the first question on your report: "Does consumer report gas service satisfactory?"
   1. While you are entering the house, ask "Has your gas service been satisfactory?" Never ask your question when you are leaving the house. We want to know what the consumer reported when you arrived at the house, before you did any work.
      a. To avoid confusion, do not ask this question if the lady tells you when you enter that the gas has been smoking her utensils, because she has already answered your question.
   2. This question should be asked for two reasons:
      a. To answer the question on your report.
      b. To find out if there is anything in particular the consumer wishes to call to your attention.

g. How to answer the second question on your report: "Attitude of Consumer Toward Corporation."
   1. This question can best be answered when you leave the house. Your answer to this question can best be formulated by the consumer's reply, if you ask the question during your work "Has the Gas Company always properly taken care of your requirements?" Be particularly careful not to encourage the consumer to state a friendly attitude, if such is not the fact. Do not overrate the consumer's attitude. We want to know if it is unfavorable.
   2. In some cases when the attitude of a large number of consumers is checked as "Indifferent or Unknown" it is evident that the adjuster has not taken the proper interest in the people he has met.
   3. When answering this question, always bear in mind that the question does not read: Attitude of Consumer toward Employee.
   4. Under "Remarks" state, if possible, the reason why the consumer is unfriendly and what advice you gave the consumer.

VI. RULES AND REGULATIONS GOVERNING ADJUSTMENT OF APPLIANCES AND METHOD OF MAKING REPORT

a. Use of red and blue pencil.
   1. General records and data should be written in blue.
   2. Notations regarding dangerous or worn out appliances, or particularly important facts, should be written in red. Whenever possible, always list the names of dangerous or worn out appliances.

b. Method of making report on range.
   1. Report the name of the range and the number of top burners and oven burners.
   2. State whether or not the range is equipped with an oven heat control.
   3. State just what you did to each burner.
      Example: 4 top burners, peined 2, increased air 3, cut gas 1; 2 oven burners, increased air 2, gas OK.

GAS RANGES.

c. Methods of making range adjustments.
   1. Make adjustment of oven burner and leave this burning with door closed, until completion of adjustment of top burners. Upon completion of adjustment of top burners check operation of oven to be sure that flame has not smothered. Be certain to provide adequate gas supply and large enough flame in oven. Oven burners generally require greater air shutter opening than is necessary for top burners, because of difficulty of introducing air. Always open the oven door and remove anything that may be in the oven before lighting the oven burner. Do not open oven door if lady is baking a cake.
   2. Advise consumers that we make no adjustments of oven thermostats and that we do not touch such devices, as those adjustments must be made by an expert representing the particular device in question. Where unsatisfactory combustion conditions exist, on thermostatically controlled ovens, only adjust the air shutter, the adjustable orifice, or the pilot light and see that the minimum height of the flame with the thermostat turned low does not reduce below ⅛-inch. The tip of the pilot should not project into the burner flame, as that would cause burning off of the pilot tip. The flame of the pilot burner should, however, strike the flame of oven burner, and be about ¾-inch in length in order to assure proper relighting of the oven burner. Do not remove or pein oven burner orifice on thermostatically controlled stoves. If the gas has been cut down by the orifice on such ovens, advise the house that it will take slightly longer to heat the oven but that this adjustment has not in any way involved the thermostat, but the new adjustment will give higher efficiency with the use of the gas.
   3. Adjust the top burners of stoves with the gas cocks wide open. The flame should then be adjusted to rise about 1½-inch above the top of the stove grids. Then adjust air shutter to obtain clear soft blue flame which does not blow from burner ports. Care must be exercised not to leave excessive air shutter openings, as this may cause trouble on winter days when mixed gas is supplied. With burners adjusted as above, the tip of the flame should then just touch the bottom of the kettle when the gas cock is *partially* opened to the position *normally* used by the housewife. Advise housewife not to open gas cock so wide as to let flames pass up around the sides of the kettle as this is a very wasteful practice, and also tends to cause gas fumes.
   4. Pein orifices when necessary to obtain proper burner adjustment, even if such work requires removal of manifold of the range in order to remove the oven burner orifice, except in cases where oven thermostats are used, in which case never remove manifold, but refer consumer to agent who sold the stove. Make note on your report stating what was wrong and why adjustment was not made, and advice to consumer.
   5. Always adjust the lighter, if consumer uses same, and make a note of this on your report.
   6. Use your wire brush and reamer for cleaning dirty burners. Do not tell the consumer to use an ice pick or a hair pin to clean dirty burners. *Do it yourself.* Whenever possible use your Crescent wrench on orifice caps. Do not use your pliers unless it is necessary, because they leave marks and sometimes will cause consumer to feel dissatisfied with your work.
   7. Always call the lady and have her pass on your work before leaving the house. Some people want the burners turned up high; others want them low. Be careful not to get burners turned too low. Call the consumer's attention to the fact that if the burners are a little high it is always possible to turn them lower with the valve.
   8. If the range is worn out, has broken parts, warped burners or oven lining, poor oven circulation, or if you referred the party to the agent, make a note of this on your report with your red pencil.
      a. Where requested, instruct the consumer in the proper use of all gas appliances, but do not pass judgment on the equipment installed, and under no circumstances give an unfavorable opinion on any make of gas appliance.
   9. Do not use your extra valve to replace a broken one unless you broke the valve yourself. A new valve will not be given to you unless you turn in the broken one to your team captain. Report all breakage caused by you to your team captain so that he can make arrangements for replacements.
   10. If the lady says that she will purchase a new range, or any kind of a new appliance, make a note of this on your report so that it will be possible to compile a list of all prospective appliance purchasers. Extend an invitation to the consumers to visit our appliance exhibit on the 8th Floor of our office building, 810 So. Flower Street, Los Angeles, whenever you think that they would be interested in purchasing either gas or electrical appliances.

d. Method of making report on water heaters, and rules governing adjustments of same.
   1. Report the *name* of the water heater, and whether it is a *tank heater*, a *combination heater*, an *instantaneous automatic heater*, or a *thermo-storage heater.*
   2. Whenever it is necessary to pein the orifice on a water heater, this may be done if the burner can be removed, except on automatic heaters.
   3. If you find it necessary to remove a burner on a tank water heater to make a proper adjustment and you notice that the water pipes are so badly rusted that there is danger of

causing a water leak, or increasing the leak that may already exist, advise the consumer to call a plumber and have him install new connections. Leave a "Call Notice" with the consumer and advise him to telephone our office as soon as the heater is in such a condition that we can work on it with safety. Make a note of this on your report in red.

4. Do not make adjustments on *automatic* water heaters, other than to inspect the pilot light, and see that primary air adjustment is proper. Where flame passes into vent, condition is dangerous. Throttle gas at main valve and advise consumer to have agent make adjustment.
5. Unsatisfactory automatic water heaters.
   a. Report in detail with red pencil what is wrong and what you advised the consumer to do. Report if it is thermostat trouble, burner trouble, or improperly vented, and if you referred the party to the agent.
6. Unvented water heaters of all kinds.
   a. Report all unvented water heaters.
   b. Give exact location of water heater.
   c. State whether it is located in the kitchen, bedroom, bathroom or open screen porch. Also state if the occupant is the owner or tenant. Also, try to get owner's name and address on your report, so that he may be notified in writing.
7. If the water heater is vented O. K., write "Vented O. K." on the last line under water heaters.
8. A pilot light is to be turned no lower than three-quarter-inch high, nor higher than one inch at all times. However, pilot flame should strike burner flame.

SPACE HEATERS

e. Method of making report on room heaters, and rules governing adjustment of same.
   1. Report the name of each room heater.
   2. State in detail all adjustments made on same.
   3. If you cannot get the name, write the kind of heater it is and then write "(no name)." If it is a radiant heater, state how many radiants there are.
   4. List all broken radiants, worn out or unsatisfactory room heaters, in red.
   5. Inspect all of the room heaters.
      a. If it is necessary to get them out of a closet or attic, do so, if you have the consumer's permission. If you do this, you may save a trip back next winter when consumer desires to use heater.
   6. Floor furnaces and wall furnaces are always listed under room heaters. Do not list them under furnaces.
   7. If the consumer has no room heaters, write the word "no" or "none" after the words "Room Heaters" on your report.
   8. If you visit an office where they have room heaters and the gas is shut off, write on your report "Meter closed for summer."

FURNACES

f. Method of making report on furnaces, and rules governing adjustment of same.
   1. Report the name of each furnace and the number of units, if it is a unit system. If they do not have a furnace, write the word "no" or "none" after the word "Furnaces."
   2. Inspect all furnaces, but do not make adjustments other than the pilot light or primary air adjustment.
   3. For your protection always use a piece of paper as a torch and stand to one side when lighting a furnace or a steam boiler. If you are not familiar with lighting an appliance report the matter to your team captain or inspector who will go back with you and give you the necessary instructions.
   4. When a furnace needs adjusting, do the same as you did when you inspected the automatic water heaters. Refer them to the agent. Write this in red.
   5. The furnace people suggest that we advise the consumers to call them now, before the cold weather sets in, when they are too busy to answer all calls.
   6. If the party has a wood and coal furnace, state so on your report.
   7. Report the number of rooms in every home you visit, also state whether or not they have a fireplace, or a basement.

VII. PROPER INSPECTION OF METERS AFTER YOU HAVE COMPLETED YOUR WORK IN THE HOUSE.

a. Report all leaks.
b. Report broken or overloaded meters and regulators. Unvented regulators. Uncovered meters. Load connections. You will be rewarded for reporting "flat connections."
c. Report choked services or house lines.
d. Place a pilot tag on the house line, if there are automatic appliances in the house with pilot lights.

VIII. EVERY MAN IS ADVISED TO READ A COPY OF "GAS APPLIANCE AND SERVICE MANUAL," which may be procured from the office.

IX. TEAM CAPTAINS.

a. Every team captain has charge of a crew.
b. A team captain is not appointed unless he has served as acting captain and proved his ability and fitness for the work.
c. Duties of a team captain:
   1. Meet his men three times a day, to assist them with their reports and go back with them to adjust troublesome appliances.
   2. Inspect all of the reports every night.
   3. Arrange the routes for the next day.
   4. Keep men supplied with work, stationery, and equipment.
   5. Keep a record of the territory covered by each man every day.
   6. Keep a daily record of the number of men and completed orders turned in by each man every day.
   7. Call the office three times a day and take care of all the telephone calls received from places where his men have been and, finding no one at home, have left a call notice.
   8. Furnish transportation whenever necessary during working hours.
   9. Carry a "First Aid Kit."

X. CONCLUSION.

The employee is naturally desirous of making himself as valuable as possible to the company, and the company is just as desirous of having him develop as rapidly as possible. The following suggestions are made to help in this respect:

a. You alone can make your record good, bad or indifferent. If you work continuously, and do each job well, you can be sure your work is satisfactory and will be appreciated. Do not let the example of other men influence you in such a way that your record will be spoiled.
b. Study rules carefully, and follow them exactly. If you find it impossible or impractical to follow them in any individual case, act according to your inspector's instructions. Do not, however, continue to deviate from them, but refer each doubtful case to the inspector.
c. When dealing with consumers inclined to be unreasonable, ill-tempered, or even abusive, show every possible courtesy, and carefully avoid any show of temper. By conducting yourself this way you not only work for the interest of the Company, but for your own best interests.
d. Do not discuss alleged high bills, nor the amount of gas escaping from a leak, amount burned by certain appliances, and the time required to heat water for a bath, on the ground that so many variable factors are involved. The prohibition is not made because the Company wishes to withhold information from their customers, but only to insure that it is given by men who are better qualified to impart it. The inspector is advised to suggest to the consumer who makes a formal complaint regarding matters such as those referred to above, to call at, or telephone to the Investigation Department.

GAS MEN PROMINENT ON NEW A. P. I. ADMINISTRATION

At its December annual meetings in Chicago the American Petroleum Institute, through its board of directors, elected a new administration, E. W. Clark, vice-president of the Union Oil Company being re-elected president. Several men prominent in the gas industry were numbered on the A. P. I. slate for the coming year. A. B. Macbeth, president of the Southern California Gas Company, is an A. P. I. vice-president representing production. H. L. Doherty, of H. L. Doherty & Company is a member of the executive committee. The board of directors includes the names of N. C. McGowen, of the Palmer Corporation, Shreveport, La., also chairman of the natural gas department of the American Gas Association, and D. E. Buchanan, Chestnut & Smith Corporation, Tulsa, Okla. Mr. McGowen represents the national gas group of the A. P. I., and Mr. Buchanan the natural gasoline group.

SANTA MARIA UTILITY APPLIES TO ISSUE SECURITIES

Santa Maria Gas Company, Santa Maria, Calif., has applied to the State Railroad Commission for authority to issue and sell $110,000 of its first and refunding mortgage six per cent gold bonds at a price to net 97 per cent of the face value thereof and accrued interest, and to use the proceeds to reimburse its treasury.

"Steam Boilers" Subject *of* A. G. A. Volume

THE latest volume of the American Gas Association's Industrial Gas Series, on "Steam Boilers", is off the press. It sells for $1.50 a copy to A. G. A. members.

This volume has been specifically designed to be of service to both the user and designer of boilers using gas as their fuel. While the data given are applicable in the main for the gas-designed boiler, there are several sections devoted to the method of converting large coal boiler installations to gas firing.

A chapter of considerable interest is the one dealing with boiler feed water and feeding systems for small size boilers. Control of scale forming constituent by treatment inside the boiler is extensively treated. Attention is called to the outstanding difference in this method and the practice for large boilers using precipitating tanks and zeolite systems, as well as filters and feed water heaters for water softening.

In the chapter on the efficiency of gas boilers, new principles have been suggested showing the importance of the velocity of flue products in increasing the rate of heat transfer. It was found, for example, through careful research that less than one-third of the length of the fire tube in that type of boiler was in use as effective heating surface. At present, no conclusions are drawn from this observation, the research still being under way.

GAS APPLIANCE SOCIETY ISSUES ANNUAL REPORT

THE Fifth Annual Report of the State Advisory Committee of the Gas Appliance Society, with headquarters at San Francisco, Calif., has recently been issued to all members of that organization. The report covers the major activities of the Society for the year 1927, and presents a foreword and plan for 1928.

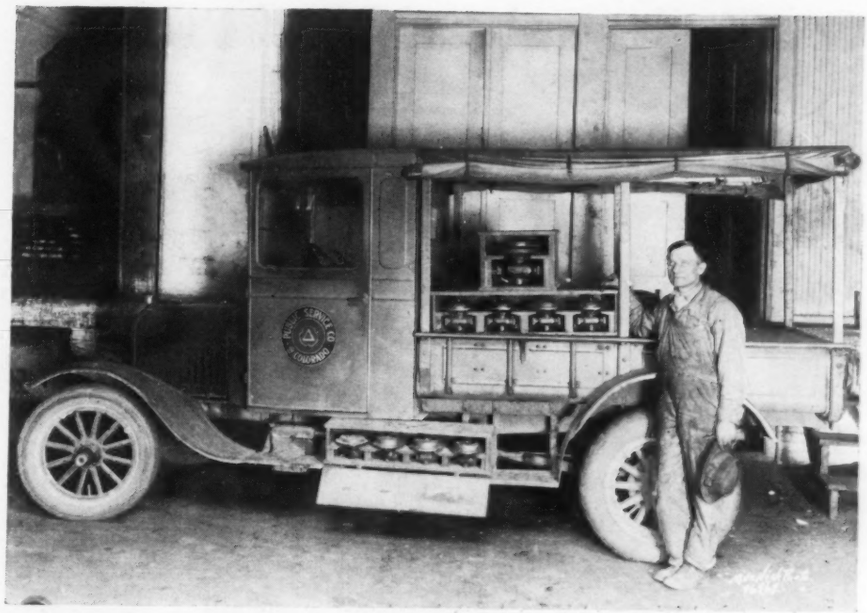
The Spring Campaign, held the first week in May of 1927, was reviewed in brief. A total of 400 full pages of newspaper space was devoted in the advertising and editorial columns of the daily papers to the activities of the gas fraternity during that week. Throughout the entire year a total of 1,200 pages of newspaper space were used in the territory of the society by dealers, jobbers, manufacturers and gas companies.

A total of 2,250 modern ranges were sold during the campaign, and during the year over 30,000 cabinet type gas ranges were sold, of which 15,000 were with oven heat control. One thousand automatic water heaters were sold May 1 to 7, the total for the year being over 25,000.

The annual financial statement shows the Gas Appliance Society received and disbursed approximately $6,000 during the year.

Plans for 1928 include four special campaigns, i. e.: Spring Campaign featuring gas ranges and water heaters; Summer automatic water heater campaign; Canning and preserving campaign; and Fall gas house heating campaign.

F. U. Naylor, who has been Secretary of the organization for the past several years, has had added to his duties that of Campaign Director for 1928. Al Crane will work with Mr. Naylor in an advisory capacity.



Showing box used for handling regulators. Albert Breuch, who appears in photo, originated the idea for the Public Service Company of Colorado.

How One Company Handles Its Service Governors

FOR several years the Public Service Company of Colorado, Denver, Colo., has tried out methods of carrying service governors so that the jars and bumps encountered would not affect the adjustment of the governor. This company has at present about 50,000 domestic size governors in use and under present operation they must be changed periodically. Over 10,000 a year are changed, so any improvement in handling methods that could facilitate work or decrease repair expense would be a good investment.

About a year ago a box was devised for handling these regulators and it has proved very satisfactory. The photograph shows one of these boxes, of 4-governor capacity, mounted on the runningboard of a service truck. Boxes for the 1¼-inch and 2-inch sizes are not fastened to the trucks, but are portable. The two in the body of the truck show the type of construction, similar to that of the service governor box on the runningboard. Each governor is held in a vertical position, with a spring clip to keep it firmly in place. Governors removed from service are carried in this box as well as new ones to be installed. Trucks used extensively on governor change work have two or more of these boxes attached.

The box idea was originated by Albert Breuch, meterman, who has been with the Public Service Company of Colorado since July, 1898. Mr. Breuch is shown in the photograph.

Increased Revenue *from* Wichita New Business Effort

IT pays to spend money to get new business. This, at least is the conviction of the Wichita Gas Company, a Doherty property serving Wichita, Kansas,—a conviction based upon observation of the results of new business efforts consistently expended by that utility since taking over the Wichita gas company in 1925. The Wichita company has operated in line with the declared Doherty policy which holds it good practice to pay dollar for dollar to get new business —but the Wichita gas men did it for 25 cents on the dollar of increased gross revenue.

Prior to July, 1925, under the company's former ownership, annual sales per customer had decreased from 98,000 to 60,000 cubic feet and the revenue per customer had dropped from $66.71 to $52.50, showing a total loss in gross revenue of $226,560.00 per year. This happened regardless of the fact that 2200 customers had been added during this period and that there had been no change of rate.

The activities of the present new business department show the following result: The total domestic consumption for the 12-month period ending August, 1927, as compared to the 12-months consumption for the period ending June, 1925, shows an increased annual revenue of $314,213. In other words, an annual decrease in sales per customer of 11.6 per cent was converted into an annual gain of 13.8 per cent, although 1,328 customers were added since June, 1925, and again there was no change of rate.

During this 26-months period approximately $520,000 was added in gross revenue at an expense of about $130,000 or roughly 25 cents of new business expense for every dollar of increased gross revenue. Through aggressive new business activities there was every reason to believe that the forecasted consumption figures would reach 96,000 cubic feet per customer by the end of 1928.

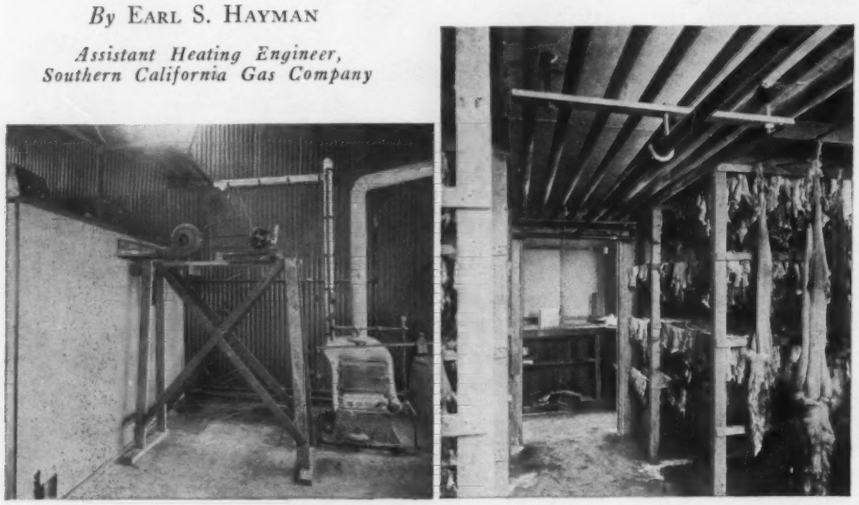
During the 26-months period an average of twenty-one representatives and engineers have placed on the lines of the Wichita Gas Company, a total of 5,798 gas consuming appliances. A total of 1,432 separate extension projects were surveyed, each involving from one to 125 customers.

On Saturday, November 26, the Wyandotte County Gas Company opened its new offices at 820-22 Minnesota Avenue, Kansas City, Kansas.

Gas Boiler Solves Novel Problem

By Earl S. Hayman

Assistant Heating Engineer, Southern California Gas Company



Left: Gas-fired boiler used in fur-drying installation. Right: Rabbit furs drying by heat from steam pipe coils above

THE new business department of a gas company is frequently called upon for advice and information relating to many varied and interesting problems, a large percentage of which necessitate special study and in all cases a thorough familiarity with the conditions to be met.

Recently, a novel case came to our attention for recommendations and advice regarding an inexpensive, safe, rapid and efficient means for the drying of rabbit furs. The owners of this particular tanning company had been using a crude, home-made hot air furnace in conjunction with a small blower fan. Their main trouble was the too rapid drying of the skins nearest the blower, with a resulting stiff, starchy fur, and the slow and unequal drying of skins farthest away from the blower. Also the consumption of gas was quite large in proportion to the work done.

USE SMALL GAS-FIRED BOILER

A study of the best modern means used for fur and leather drying was made. Using these ideas, modified by the fact that we were limited greatly in the amount of money available for this work, we modeled our plans. A small gas-fired boiler was used to supply steam to pipe coils located at the top of the dryer. This coil was graded in the direction of the flow of steam and the condensation returned to the boiler by gravity through a separate return vented to the atmosphere through an adequate thermostatic air relief valve.

At the steam inlet to the coils and a small distance above we located the duct leading from the blower fan. This created the necessary air changes and also created a small static air pressure above the coils. At the bottom of the drying room beneath the air duct we cut two rectangular holes for exhausting the moisture-laden air.

Water vapor in itself is lighter than air, but the contraction produced by the cooling of evaporation more than compensates this, and the damp air is therefore heavier than the dry. So when upward ventilation is used for drying, there is a tendency for the warm air to form local upward currents, while the cold and damp air falls back, and from this irregularity of flow it is difficult to saturate the air equally. Downward ventilation was used for the reason that when the warm air is admitted at the top of the drying room, and if there are no leaks in the top or upper part of this room, the warm air will float on the top of the colder and damper and press it uniformly down and out.

The amount of water that can be taken up by a given volume of air, and consequently the drying power of the air, increases rapidly with a rise in temperature of the air.

FREQUENT AIR CHANGE NECESSARY

Since the temperature of the air by which the drying of the goods is being effected may not be inordinately raised, and as only a definite amount of water can be absorbed by the air at the allowable temperature, it follows that in order to dry the goods rapidly the air must be frequently changed, the moisture-laden air being gotten rid of, a fresh supply of heated air taking its place. The more frequently this change of air is made the more rapid will be the drying of the skins; the getting rid of the moisture-charged air and the introduction of a further supply of heated air should indeed be continuous as the drying of the goods proceeds.

A most important factor, when the drying of the furs is to be effected, is the hygrometric condition of the air; that is, the amount of moisture it already contains when the drying of the goods is begun. From a practical standpoint this is of more consequence than the temperature of the air, especially in the case of drying wet goods after preparation. It is evident that the heating of the air has to dry the existing humidity in it first of all before it can be serviceable in the direction of evaporating water from the goods at all.

This inexpensive system has proved very satisfactory, with a resultant soft dry fur, very fast and even drying, and a very great saving in gas. As steam heated air is limited in temperature to a maximum of approximately 212° on very low pressure, there is no danger of using over-heated air. The system is also almost entirely automatic in operation.

GASOLINE AND REFRACTORIES ON CHEM. INSTITUTE PROGRAM

From December 5 to 8 the American Institute of Chemical Engineers assembled at the Hotel Chase, St. Louis, Mo., in their twentieth semi-annual meeting. At nine o'clock of the opening morning, a symposium on natural gas gasoline was held, under the chairmanship of R. T. Haslam. The following features comprised the symposium:

"Oil Absorption of Natural Gasoline," W. K. Lewis. (This paper is published in full in this issue.) "Factors in Design of Heat Transmission Equipment in Natural Gasoline Plants," W. K. Lewis. "Natural Gasoline and Motor Fuels," George Granger Brown. "Recoverable Hydrocarbons from Natural Gas and Their Relation to the Composition of Commercial Motor Fuel," Stewart P. Coleman. "A Commercial Plant for Catalytic Oxidation of Oils," J. H. James. "The Use of Chemical Reagents in the Protection of Atmospheric and Pressure Distillation Equipment Against Corrosion," Gustav Egloff and Jacque C. Morrell.

A joint session was held on the second day, with the American Refractories Institute, J. M. McKinley, president of that organization presiding. A motion picture on "The Story of Fire Clay Refractories" was shown. Papers included:

"The History and Status of the Refractories Industry," J. D. Ramsay. "Problems in the Development and Technology of Refractory Materials," Stuart M. Phelps. "Some Special Refractories in the Experimental Stage," George A. Bole. "Developments in Burned Dolomite as a Stable Basic Refractory," M. E. Holmes and George A. Bole. A round table discussion of problems encountered by chemical engineers in the use of refractory materials was also conducted.

C. S. NORTHCUTT KILLED IN AUTOMOBILE ACCIDENT

Charles S. Northcutt, San Joaquin Division Manager of the Pacific Gas and Electric Company, with his office in Stockton, Calif., was killed in an automobile accident the night of December 17 when he failed to negotiate a curve with his car near Escalon, outside of Stockton.

Northcutt was well known in the gas industry, having been vice-president and general manager of the Western States Gas and Electric Company, before that property was acquired by the Pacific. Just a few months ago he was announced as the new Division Manager over the same territory that he had previously served with the old company.

Active in civic affairs as well, he was a member of Stockton Rotary Club and a director in the chamber of commerce of that city. He was 41 years of age.

NEW MUSKOGEE COMPANY

Frank DeMayo of Kansas City is president of a newly chartered company, Muskogee Natural Gas, Inc., which has opened offices in Muskogee, Okla. Capitalization of the company, which it is understood intends to pipe gas for industrial use into Muskogee, is $150,000.

CANADIAN UTILITY USES RADIO TALKS

The Canadian Western Natural Gas, Light, Heat & Power Company of Calgary has inaugurated a series of talks over radio station CFCN. The use of gas heating and cooking equipment, and other appliances operated by gas are interwoven with talks on recipes for cooking, and with household hints.

BYLLESBY SALES AND ADV. DEPT. MEN ADVANCED

Several advancements in the sales and advertising department of Byllesby Engineering and Management Corporation have been announced as effective December 1 by W. H. Hodge, vice president of the company and manager of the department concerned. J. W. Devereaux is now manager of the merchandise division, after 16 years with the Byllesby organization. T. P. Pfeiffer, since 1922 in the Byllesby headquarters advertising department, and prior to that with the Louisville Gas and Electric Company, has become manager of the advertising division. J. F. Gardiner, also with the advertising department since 1922, becomes manager of the financial advertising division. J. W. Hicks, for the past two years managing editor of "Byllesby Management", and for several years prior engaged in newspaper work in the Middle West and on the Pacific Coast, is now editor Byllesby publications, taking on the editorship of "Byllesby News Bulletin" and "Byllesby Monthly News" in addition to "Byllesby Management."

PAN-AMERICAN PLANT MEN ON INSPECTION TRIP

A group of 30 picked plant men of the Pan-American Petroleum Company-Petroleum Securities Company gas department, Los Angeles, made a trip of inspection over a number of natural gasoline plant properties of other companies on December 2. The trip, which was conceived by executives of the Pan American gas department, was designed primarily as an educational stimulus to those making it, and, according to H. L. Eggleston, manager of the company's gas department, has already given direct evidence of having well served its purpose.

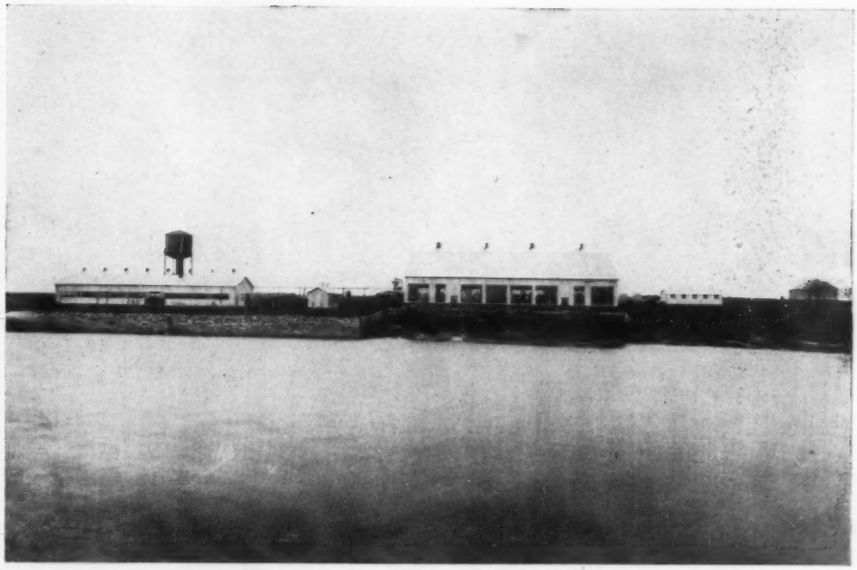
Following the inspection trip an evening meeting was held at Paulais Cafe, Los Angeles, attended by 108 members of the organization, including those making the trip. Discussion at the meeting was concerned with developments of the inspection trip, with fire prevention and safety practice, and related topics.

NATURAL GAS PIPELINE TO OKLAHOMA CITY COMPLETED

Oklahoma Natural Gas Corporation, which delivers gas at the City gate for distribution in Oklahoma City by the Oklahoma Gas and Electric Company, has completed its new 16-inch line from the Chickasha field to Oklahoma City. Work on this line began October 8. The line, about 35 miles long, starts at the Norge Compressor station south of Chickasha and ends at the South Canadian river crossing, south of Oklahoma City, paralleling a 12-inch line which was constructed several years ago from the Duncan and Walters fields to Oklahoma City. It will make available to Oklahoma City, if needed, approximately three times as much gas as formerly. The company has five lines crossing the South Canadian river and six crossing the Washita, the multiple crossings being installed to guard against interruptions of service by floods.

P. G. AND E. EXECUTIVES HOLD LUNCHEON; 1928 PLANS TOLD

A luncheon to approximately 150 executives and department heads of the P. G. and E. was given on Friday, December 30th, at the Cliff Hotel, San Francisco. Addressing those assembled, President Hockenbeamer outlined in broad terms the projected activities for 1928 of this company.



This City's Service compressor station at Ottawa, Kansas, which has been very recently completed, will be used in connection with the new 20-inch line from Pampa, Texas, to Wichita, Kansas.

Beautification *of* Gas Properties

(Continued from Page 20)

other property, such as telephone poles, is near the house it is also painted.

BILLBOARDS TO BE USED

Road signs will also be placed at advantageous positions on approaching the larger compressor stations, giving the traveler information as to just how each station fits into the general network of service and how it affects his individual needs. On some of the billboards will be placed a map of the entire gas system of lines and compressor stations, while on others will be placed advertising designed to bring to the reader's mind the tremendous investment necessary to bring the gas several hundreds of miles to his own fireside.

The beautification idea will also extend to the residence property of the men who operate the plant. Some of our stations have as many as eighteen or twenty homes for employees. These are well constructed and practically all are equipped with electric lights, gas and water. Clothes lines are run from one end of the property to the other, three-inch pipes being used for posts. These posts are set about six feet apart, and a cross bar welded over the top. This arrangement will accommodate four lines, which run the entire length of the property. The posts are set in concrete and painted. Hoops are welded to the clothes line posts, and the trash cans are placed in these. Community houses are being built at the larger properties in order to give the employees and their families a place to congregate for parties, educational meetings, etc. Amusement facilities of different kinds, such as swings for the children, croquet grounds and tennis courts, are being installed with the idea of keeping the employee in a better attitude of mind toward the company insofar as he is influenced by his surroundings.

Clubs are being formed at the various properties with the aim in view of interesting the women in assuming a personal responsibility in the general appearance of their homes and yards. Associated with this activity will be something of a social nature, such as "bridge," "five hundred" or some form of relaxation equally as interesting.

I am mentioning some of the minor details in this connection to bring out the fact that we are leaving nothing undone which will reflect the company's interest in the employees and its desire to impress the public that we are anxious to see that their individual needs are taken care of.

It is hard to calculate the moral effect on a community from such a program as we have inaugurated. Certainly this phase of our work will not pay cash dividends, but there is no question but what the townspeople will have a more friendly attitude toward a company which takes pride in keeping the appearance of its property in a presentable manner, and further that the employee will go to his work each day in an attitude in keeping with the human service he is rendering.

FINISH CHICKASHA LINE

The Oklahoma Natural Gas Company's new 16-inch line from the Chickasha field to Oklahoma City was completed about the middle of December. This line is 35 miles in length. The company, owing to an increased gas supply around Muskogee, is overhauling its lines around that city, replacing 4-inch line with 8-inch in many cases.

P. G. AND E. ASKS STOCK PERMIT

Pacific Gas and Electric Company, San Francisco, has applied to the Railroad Commission of California for authority to issue and sell $6,460,000 of its common capital stock, and to use the proceeds to finance additions and betterments already made or proposed. The company plans to offer the said common stock to its common stockholders in the ratio of one share of the new stock for each ten shares of outstanding stock held by its stockholders.

Two views of the co-operative exhibit set up by three gas companies at Builders Exposition; general view, above; model kitchen, below

Three Gas Companies *in* Co-operative Exhibit

GAS companies of Southern California united in maintaining a co-operative exhibit at the Los Angeles Builders Exposition, held at the Shrine Auditorium in that city from November 28 to December 3. The purpose of the exhibit was to place before architects and builders of the locality the most modern developments in gas appliances.

With one or two exceptions the appliances shown were all A. G. A. approved, bearing the Blue Star. On exhibit in the six booths taken by the gas companies were the latest in water heaters, ranges, space heaters, radiators, furnaces, refrigerators, and a number of small appliances such as toasters and coffee percolators—all of them, naturally, being gas-fired.

A modern all-gas kitchen was fitted up for the display, and was in charge of Miss Isobel Allobach, managing director of Home Service for the Southern Counties Gas Company.

Clyde H. Potter, Frank Weiss, and C. M. Grow, commercial department heads of the three respective companies which united in preparing the exhibit—the Southern Counties Gas Company, Los Angeles Gas and Electric Corporation, and the Southern California Gas Company, designed and laid out the six booths. J. E. Kern, of the Southern California Gas Company new business department, had charge of arrangements at the display during the exposition dates.

Particular interest of those attending the exposition was directed to the combination gas range-gas refrigerator on exhibit—the first showing in Southern California of the new Electrolux Servel-Tappan gas range unit.

The gas company exhibit was generally voted to be the most attractive and valuable display of the Builders Exposition, and is an outstanding evidence of what can be accomplished by company co-operation.

Individual gas appliance manufacturers of Los Angeles, and also the Gas Furnace Association of Southern California, took a number of booths adjoining those of the gas companies, with the result that gas was well represented before the gathering of architects, contractors and builders.

HOUSTON PIPE LINE CO. 12-IN. LINE NEARLY COMPLETE

The Houston Pipe Line Company is rapidly completing a 12-inch gas line from the Lucas field of Live Oak County, Texas, to the Cole field, near Laredo, on the Rio Grande River. This line is a parallel to the initial line laid more than a year ago and doubles the potential gas transmission capacity in this territory.

OKLAHOMA NATURAL GAS CO. BUYS GAS BRANCH OF O. G. & E.

Gas holdings and facilities of the Oklahoma Gas and Electric Company of Oklahoma City will be taken over by the Oklahoma Natural Gas Corporation March 1, following the closing of a deal December 17. This purchase, estimated at more than $10,000,000, gives the Oklahoma Natural the distribution of natural gas in about 50 Oklahoma cities, including the properties, facilities and retail rights, R. C. Sharp, president of the buying company, announced.

J. F. Owens, vice-president and general manager of the selling concern, stated the plans of his company would be directed in the future to the electrical business only. This company, while serving only 14 cities with natural gas, has been serving 167 cities with electric power.

Oklahoma Natural was bought May 23, 1927, by Phillips Petroleum Company after the consolidation and reorganization in September, 1926, of the Oklahoma Natural, Okmulgee Gas Company, Kingwood Pipe Line Company of Okmulgee and the Southern Gas Company. G. L. Ohrstrom & Company, New York bankers, headed a syndicate three months later in buying the Phillips' interest in the company.

McKAY NAMED PRESIDENT OF UTILITY SECRETARIES GROUP

E. F. McKay, manager of the Oklahoma Utilities Association, Oklahoma City, was elected president of the National Association of Public Utility Secretaries, at the organization's three-day conference, December 5-7, in Oklahoma City. O. A. Weller of Denver, Colo., succeeded Mr. McKay as secretary. The 1928 meeting of the association will be in New York City.

Practical phases of utility association convention organization work concerned the secretaries in the recent meeting, as evidenced by the following selections from among the topics considered in their discussions: "Entertainment—uses and abuses", "Registration fee vs. passing around the hat", "Does it pay to publish lists of those in attendance, or a periodical during the meeting?", "Committee appointments—who should make them and when should they be made?", "What proportion of talks should be by women?", "Speechless banquets", "How long can a session run if talks are short and seats comfortable?"

The Oklahoma City meeting wound up with a trip to the Seminole oil fields.

13 MISSOURI TOWNS GIVE GAS FRANCHISE RIGHTS

Missouri Natural Gas Company has been granted franchises in thirteen towns of Southeast Missouri, Doniphan being the latest to accord the permit. Sixteen villages, in addition to the thirteen towns, will be on the company's lines, franchises being secured for them through county courts.

DE BEQUE COMPANY FORMED

De Beque Gas & Electric Manufacturing Company, has been organized at De Beque, Colo., to furnish that community with natural gas from shallow wells recently drilled within the city.

BABCOCK VISITS NORTHWEST

C. B. Babcock, president of the C. B. Babcock Company, San Francisco, in December made a business trip through the Northwest, and reports that he found the gas industry of that territory completing a very satisfactory year.

SPECIAL A.G.A. CONTEST FOR BEAL AWARD

A special contest to be conducted every year for the Beal Medal of the American Gas Association has been announced by H. W. Hartman, assistant manager of the Association and secretary of the Technical Section. This medal, awarded for the first time in 1897, is given by the Beal family for the best technical paper submitted at the annual A.G.A. convention.

A.G.A. members are invited to submit papers on technical subjects, a special subcommittee of the Technical Section to judge the papers and select three for presentation at the sessions of the Section during the annual convention. They will thus become eligible for the medal.

Original work on technical developments of fundamental importance to the industry must be covered in the papers. This does not exclude new or novel methods of handling existing problems or apparatus, but rather confines the award to the outstanding paper representing a distinct contribution to the progress of the industry.

FURNACE GROUP XMAS JINKS

Meeting at the Beverly Hills Club, Beverly Hills, Calif., on the evening of December 22, members of the Gas Furnace Association of Southern California held their annual Christmas Jinks.

FLINT ADDRESSES S. F. UNIT

Kendall H. Flint, representative of the American Gas Association Laboratory on the Pacific Coast, spoke on the work of that institution at a noonday meeting of the San Francisco Unit of the Gas Appliance Society, held in the Clift Hotel, December 10th. Mr. Flint gave a thorough description of the methods employed in making the laboratory tests. He also pointed out that gas companies throughout the entire country are making greater efforts as time goes on to prevent the sale in their respective territories of appliances not having the Blue Star of approval. George P. Egleston presided at the meeting in the absence of the president.

On Friday evening, December 11th, Flint addressed an evening meeting of the Oakland Unit of the G. A. S., making substantially the same observations as in his San Francisco message.

SAN DIEGO STOCK ISSUE

San Diego Consolidated Gas and Electric Company has applied to the California Railroad Commission for permission to sell $2,000,000 of common capital stock at $100 per share for the purpose of paying indebtedness and financing construction expenditures.

BUYS EL DORADO GAS CO.

Ouichita Natural Gas Company of Monroe, La., early in December purchased the El Dorado, Arkansas, Gas Company and its holding interests, the Central States Gas & Electric Company, and all the interests of H. Wade and S. R. Morgan in the Louisiana-Arkansas Pipe Line Company, the consideration announced being $1,350,000.

LARGE GAS PRODUCTION IN RICHLAND PARISH, LA.

Nineteen out of twenty wells drilled recently in Richland Parish, La., have turned out gas producers, ranging in yield from three to sixty-seven million cubic feet each.

Samples of three-column eight inch advertisements run in support of P. G. and E. water heater campaign

Up-*to*-Date Water Heating Stressed *in* P. G. *and* E. Ads

HOUSE-TO-HOUSE selling of water heaters by representatives of the Pacific Gas and Electric Company in Stockton, Calif., has been given effective newspaper support through a "different" campaign of newspaper advertising, prepared by the gas company's publicity department. Advertising campaigns which consciously attempt to be "different" too often go wide of their point, but this one, which was conceived by J. Charles Jordan, manager of the P. G. and E.'s publicity department, is something else again. While it achieves attention through colorful human interest appeal, it puts over a common sense gas sales message—with coupon attached—that has been bringing results.

Three of the advertisements making up this P. G. and E. series are shown above. Each carries the same banner—"Just as old-fashioned as waiting for hot water"—but the sketches and "copy" are different for each insertion.

The message can hardly be escaped that obsolete gas burning equipment is no more to be tolerated than, for instance, the "horseless carriage" pioneers of the modern automobile.

Each piece of copy carries a coupon which, when mailed in to the company's local headquarters, brings a P. G. and E. water heater sales representative to the prospect's door, and company salesmen in Stockton territory were afforded more live "leads" through this device than they could handle in the campaign period.

The P. G. and E.'s direct selling campaign on water heaters is progressing over much of its suburban territory, and, supplemented by the advertising described in the foregoing, should do much to win all but the most recalcitrant away from the zinc bathtub era of gas appliances.

C. J. REILLY ON COAST

Charles J. Reilly, representative in the Southwest for Hammer-Bray Company, Oakland manufacturers of Spark stoves and ranges, was on the Coast in December. He was planning a swing through the Northwest, returning to Texas in February.

ROCKY MT. GROUP ELECTS

M. C. Henderson of Great Falls, Montana, was elected president of the Montana Chapter, Rocky Mountain Oil and Gas Association, at its Great Falls convention held December 9-10. Upwards of 300 attended this third annual meeting. Walter F. Brittan of Great Falls was named to succeed himself as secretary of the chapter.

FREE GAS! BELIEVE IT OR NOT

Under a Constantinople dateline the following newspaper item appeared late in December:

Gas is free in Stamboul, the ancient quarter of the Turkish capital, and will be as long as the new concessionaire cannot get the plans of the mains and the accounts from the former holders, who say they are lost. Numerous leaks and cases of asphyxiation are being reported daily, but it is impossible to remedy them unless the old cobbled streets are taken up at the concessionaire's expense.

COMMISSION TO DECIDE ON SERVICE FOR NILES

Whether the Pacific Gas and Electric Company or the newly formed Alameda County Gas Company will be privileged to serve the towns of Niles, Centerville, Alvarado and Newark rests with the California Railroad Commission now, with a ruling expected at an early date.

Both companies have secured franchises from the Alameda County Board of Supervisors, and final selection will rest on the Commission's issuing of a certificate of public convenience and necessity to one of the applicants. In the meantime the P. G. and E. is taking applications for gas service from potential consumers in the disputed territory.

SO. WEST. PUBLIC SERVICE ASSN. MEETS IN FEBRUARY

E. N. Willis, secretary of the Southwestern Public Service Association, announces the next meeting of that organization for May 2-5, at Dallas, Texas.

GREELEY UTILITY SOLD

On December 16 the Greeley, Colo., Gas & Fuel Company was sold to the National Gas & Electric Corporation of Chicago.

With *the* Metermen

Excellent Program *at* Dec. Meter Session

SOUTHERN CALIFORNIA Meter Association men, in spite of inclement weather, gathered at the Breakers Hotel, Long Beach, for their regular monthly meeting on December 29. There were 65 present.

During the dinner several entertainment features were offered, among them two vocal solos, two "Black Bottom" numbers and a piano solo, all by West Coast theater talent.

President T. K. M. Smith opened the business session by presenting a gavel made of Hawaiian wood, which he brought from his recent visit in Honolulu, to the association. Minutes were read by Carl W. Brockman, secretary pro tem., in the absence of R. N. Brown, the association's secretary, who has been confined to the hospital for several weeks. A letter from Mr. Brown, acknowledging the association's gift of a book, was read at the meeting.

The program of papers prepared for the December meeting was an excellent one, each paper being followed by a free and interested discussion from the floor. M. O. Jensen of the Jensen Instrument Company, read the first contribution, a description of the new Foxboro Orifice Meter. Mr. Jensen had a 50-inch meter of the new type on display, and it was inspected during the discussion following his paper. A. S. Semino, of the Shell Company of California, led discussion on this paper.

E. G. Hoggard followed Mr. Jensen with a paper on the specific gravity of wet gases, which was also discussed from the floor, J. J. Delaney directing the discussion. Both of these papers appear in this issue of *Western Gas*.

The meeting was extended one-half hour past the 10 o'clock adjournment time announced, to listen to a paper by R. A. Keans of the Union Oil Company of California, on "The Measurement of Gas by Orifice Meter." This paper is the first of a related series of three. The other two, planned for presentation at the January 26 meeting of the Southern California Meter group, are "Measurement of Oil by Orifice Meter," by Robert F. Angel, and "Measurement of Steam by Orifice Meter," by George W. Salisbury—both men also being with the Union.

President Smith announced that election of officers for the next six-month period will be held at the January meeting, which is also to be at the Breakers Hotel, Long Beach. Completion of the association's by-laws is another item of business for this meeting and will be handled by W. M. Bradford, chairman of the by-laws committee.

1927 EARNINGS SHOW GAIN

For the twelve-month period ending November 30, 1927, the Los Angeles Gas and Electric Corporation reports net earnings of $4,674,236.95, an increase of $1,999,542.17 over the preceding twelve months. Gross earnings were $21,413,670, an increase of $4,294,095.23.

The New Foxboro Meter

By M. O. JENSEN*

THE subject assigned for this paper is "The New Foxboro Meter." You can probably appreciate it is not an easy matter to say much on a subject such as this without reflecting commercialism. It is hoped you will not absorb these reflections and will accept all statements in the light of merely instruction. Furthermore, it is hoped that competitive meters will be presented to you, if not already done; and for fear some of you may misconstrue the motive of any statement, please be reminded that other meters have their merits

By way of introduction, the function of an orifice meter is to accurately record both the static pressure creating a flow in a pipe line and the differential or drop in pressure through an orifice, venturi tube, pitot, etc. This is common professional knowledge and more, it is the "target" of manufacturers of good instruments. While the new Foxboro meter is of subject, let us first consider the Type C meter (the original Foxboro meter). From an engineering standpoint, they are basically the same. The new 100 and 200 types are just a step forward with several practical advantages which you will recognize.

The static record seems to be held of minor importance by many meter men. This might be true at high pressures but certainly not at low pressures and vacuum. One pound error at 10 pounds represents a 2 per cent error in total flow while 1 pound or 2 inches at 12-inches vacuum or 9 pounds absolute equals 5 per cent error. Then there is the feeling that static elements soon become inaccurate and they are often set by a so-called test gauge, at working pressure. In the face of all this please accept the statement that Foxboro static helical pressure tubes will not fatigue and are guaranteed permanent in calibration. The Foxboro helical tube is a product of a special process whereby inherent and forming stresses are scientifically removed and variable cross sections balanced to an accurate calibration. The motion is conveyed to a center shaft thereby establishing a true lever radius for every pressure and at the same time reenforcing the tube making it considerably less susceptible to vibration. This construction also permits pen arms to travel on same arc and center which adds to accuracy. Incidentally, any tube is both a pressure and a vacuum tube. For instance, a 0-50 lbs. tube in the new 60-inch meter is also a vacuum 0-35 lbs. tube. A pen arm adjustment and change of chart permits a vacuum reading. While not intended the double lever and link arrangement can be adjusted with a view to calibration by any one who is resourceful and versatile. The static tube with its piping connection is mounted as a separate unit in the recorder case. The removal of four screws makes it possible to conveniently change a static tube in a very few minutes without removing any differential parts to effect calibration. What has been said about the static assembly is equally true of both types of Foxboro meters.

The differential mechanism is of the mercury float type. A high pressure float chamber and a low pressure calibration chamber are connected to form a U tube. The chambers are sealed and connected to opposing pressures operating in obedience to "Pascal's Law of Confined Pressures," namely, "pressure applied anywhere to body of confined liquid is transmitted by the liquid so as to act with undiminished force on every square inch of the containing vessel or vessels." It is quite apparent then that a difference of chamber areas gains a mechanical advantage. In this respect such a meter is no different in principle than the hydraulic elevator or barber's chair. In every mechanical advantage there is an equal disadvantage. With a 10 pound force a barber may lift a 200 pound person but the load will move up only 1-20 of the distance of the barber's stroke ignoring the mechanical advantage of the lever handle. In a meter of variable chambers the mercury level similarly changes less in the larger chamber than it does in the smaller.

This leads us to consideration of the calibration stick in the Type C Foxboro meter which has a fixed float lever. It is a fact that, for instance, the trigonometric cosine of the angle between a float lever and horizontal decreases for each equal angular movement. Every motion in the meter is theoretically uniform except this. This variable must be compensated for regardless of float travel. There is a certain job to be done in moving a pen arm approximately 4-inches across a chart. If a small mercury travel is used, then mechanical advantage must be attained by use of long levers, and vice versa. By using a small mercury travel the error of angularity is small, but theoretically it is necessarily multiplied by longer levers to a point of equality with that of greater mercury travel with shorter levers. Let us say here it is possible to utilize a small mercury travel in only one direction from horizontal and compensate for a one sided error of angularity by an adjustment of levers. But there are other considerations. Mercury has no affinity for iron and steel, yet it has been advanced there is an ionic action which creates resistance and aside from this we must admit of friction because of the mere fact of motion. Friction is the barrier to perpetual motion. Therefore, a large mercury travel for full range means a comparatively large travel for only 1-10-inch water differential and furthermore there will be no hang-up.

This is reasonable, and then consider the added effect of dirty mercury and foreign

*Delivered at the December 29 meeting of the Southern California Meter Association, at Long Beach, Calif.

matter which is often present.

Coming back to the error of angularity; it is present in the Type C meter and is compensated for by the calibration stick. This stick, usually of variable cross section, establishes a variable exposed area in low chamber. This means according to Pascal's Law that for a change in differential pressure the mercury and float have a variable travel thus compensating for error of angularity.

It is this inherent error of fixed levers that inspired Foxboro to design the new type. By use of a segmental lever and opposing balanced chains held taught and in intimate contact with the lever by a helical spring, the stem has a 90° relativity to the segmental lever for every inch of differential. In short, every motion throughout the mechanism is uniform. In such a meter a fixed amount of mercury is not vital. Just be sure the pen arm clears all graduations, set zero, and the meter is in calibration. This meter needs no calibration, at least for several years. The mercury chambers can conveniently be removed, cleaned and replaced in short order and the customary calibration time saved without any risk. The only thing which can affect calibration beyond cleaning and care, which are under control, is corrosion of the chamber walls. Assume a ridiculous increase of 3/32-inch in diameters, then the ratio of chamber areas is affected only 2 per cent, and this per cent can then be compensated for at all points by adjusting the segmental lever; assuming of course that there is a fairly uniform change in diameters. However, no such corrosion will take place in many years.

Any and all friction in the meter is infinitesimal due to the large mercury travel, to the small projected area of all bearings, and to a very heavy float with its contingent large opposing hydrostatic area.

While the error of angularity inspired the new meter, it was only natural other refinements should be made. There are several. As in the Type C meter, castings with their hazard of flaws and porosity are not used for the mercury chamber. These are made of sheet cold rolled steel drawn to accurate dimensions by a series of precision die and punch operations. Recognizing the error caused by elasticity responding to high pressure, these drawn steel chambers are reinforced and held in place by heavy spider castings and sets of stay bolts. It is apropos to mention here the flexibility of the differential ranges. It has always been and still is possible to change the static range, and now in this meter it is possible to change from a 100 differential range to a 50-inch range by changing the low pressure chambers and vice versa. It is not necessary to remove meter from the line nor recalibrate.

The check floats are still of the torpedo pattern and submerged at all times in the mercury free from the ill effects of corrosion and foreign matter. The checks, however, are of larger, sturdier design. Similarly the pressure tight bearing shaft is twice the diameter of the Type C shaft and four times sturdier. These parts are still being made of stainless steel free from corrosive frictions. Right here let it be said that it takes longer for the larger volume of mercury in the new meter to transpose. This has an advantage in some applications and will appeal to many, but there are other applications and many who will prefer more sensitivity. This is obtainable by specifying extra large bore U bends.

This brings to mind the possibility of error due to temperature effect on the mercury. There is an effect which, however, can be and is reduced to a minimum. The amount of mercury travel is irrelative as again there is a definite job to do and levers play a part. If any advantage, it is in favor of greater mercury travel. While cubical expansion is greater the difference is fixed and multiplied to a lesser degree by shorter levers and pen arms. By actual tests for instance the new 100-inch meter has a temperature error for 500 change of .4 per cent at 1-inch differential, .3 per cent at 25-inchs, .2 per cent at 50-inches and .1 per cent at 100-inches. These percentages with very little change if any apply to the other ranges. The effect of this is not over 1/10th-inch water differential error. The decreasing error might be questioned, but it is explained by the fact that while the absolute cubical expansion of the mercury creates an error, at the same time the specific gravity is lessened which means the mercury drop and rise is greater for each inch of differential. It was only natural then for Foxboro engineers to make the high side of meter its float chamber. Since each inch of differential means more drop in the high side it tends to gradually offset the error of expansion. It is because of this, that the error is decreasing and favorable as the differential increases.

Continuing attention is called to the embossed pen arms which cannot be altered in setting by accidental contact when changing charts. The differential pen arm now has a micrometer screw adjustment like the static pen arm, functioning on a common center, which facilitates zero settings. Zero setting is made convenient in this meter because the meter motions are uniform throughout and a little condensate on one side or both does not disturb calibration.

While Foxboro charts have always been made from well seasoned stock and printed and perforated in one operation, the accuracy of this new meter demanded a still better paper stock. A special paper has been developed which is not affected by humidity and the color is now buff, making charts easy on the eye while interpolating. I might add that all meter parts are standard and interchangeable and adapted to standard tools. The pen arm and support assembly inside the case has been simplified to a few parts.

Specific Gravities *of* Wet Gases

By E. G. HOGGARD*

THERE has been considerable discussion before this association in regard to a correct procedure for determining gas gravities, but it is contended that the procedure more commonly in use is not accurate when used for gases of a high gravity, and having a correspondingly high content of gasoline and water vapors. Data have been presented to the Association, however, which show that the system is accurate enough when applied to dry or residue gases.

It is the purpose of this paper, then, to present data obtained through a series of tests made to determine if and where the error exists.

PROCEDURE IN RUNNING GAS GRAVITIES

First, let us go briefly over the equipment used and the steps taken in obtaining a gas gravity. (Since the gas balance has, in the past few years, superseded the effusion bottle and other apparatus for taking gravities of gases, we shall consider only this method.) There is the small stationary type of balance, mounted on a work bench, or concrete block, or other such solid foundation in the laboratory. This is, of course, equipped with the usual manometer for balancing, and barometer for atmospheric correction. A small welded iron bomb having a cubical content of from 0.6 to 1 cu. ft. is used for transporting the samples, and together with the metermen and a tool car for transportation this just about completes the equipment.

The meterman, upon arriving on the job in the morning, loads his car with these bombs and proceeds to the field. At the first meter he attaches a bomb to the sampling valve and allows it to purge while he checks the meter. When this is completed the sample is taken, the bomb properly tagged, and he goes to the next meter. This routine is followed until the end of the day, when he returns to the laboratory and leaves the samples.

The chemist who runs off the gravities has gone home for the day, and so the samples are allowed to remain—usually outside the building—and be influenced by the varying weather conditions until morning. The gas cools from the highest midday temperature to the lowest temperature at night. Anyone who is thoroughly familiar with running gas gravities knows that anywhere from a few drops to a hundred cubic centimeters of condensate can be taken from the bomb, depending, of course, on the kind of gas and the drop in temperature. Allowing the gas to cool off has served to condense some of the heavier vapors contained, and it seems only reasonable to believe that the gas is correspondingly lighter. Very often, too, it is thought necessary, in order to protect the balance from moisture, to run the gas through a drying element, such as calcium chloride, to remove any remaining water.

Let us take an example and assume that we have a holder containing one thousand cubic feet of gas. If one pound of water is added to the gas its weight will be increased by exactly one pound. The rule should work both ways, and if the water is removed the contents of the holder should return to the original weight.

TRUE SAMPLES ESSENTIAL

Gas gravities are taken, insofar as we are here concerned, to be used as a basis for computing orifice meter co-efficients. Any error in the gravity of a certain gas will be reflected by nearly a proportionate error in the volume registered. That is, an error of 0.02 in the gravity will amount to nearly 2 per cent in the volume registered by the meter. It follows, then, that too great care cannot be exercised to see that the gravity sample is truly representative of the gas passing through the orifice plate. All the water, gasoline, crude oil or other matter

*Delivered at the December 29 meeting of the Southern California Meter Association, at Long Beach, Calif.

TABLE 1

Sample	Portable Balance	Stationary Balance	Stat'ry Bal With Drier	Total Error	Approx. G.P.M.
1.	0.656	0.657	0.656	00	0.15
2.	0.702	0.701	0.700	0.002	0.00
3.	0.771	0.771	0.768	0 003	1.25
4.	0.819	0.808	0.805	0.014	1 50
5.	0.846	0.832	0.828	0.018	1.75
6.	0.890	0.870	0.867	0.023	2.00
7.	0.914	0.890	0.887	0.027	3 00
8.	0.958	0.916	0.897	0.061	4.00
Second Day		0.890	0.882	0.076	
Third Day		0.885	0.880	0.078	
9.	1 08	.948	0.914	0.094	4.40
10.	1.56	1.60	1.60	00	Vapors

passing through the plate is registered by the meter, the same as the gas is, and a gravity test made after all or part of these have been removed is not a true sample.

In the tests of which the following figures are a record, a portable Acme Balance was used to take gravities at the meters. While these tests were being made a sample bomb was purged and filled with the gas. These samples were taken to the laboratory and allowed to remain until the following morning, when they were run in the usual way, using a stationary type Edwards Balance. To eliminate any question of error in the portable balance, it was checked a number of times by stationary balances in use in the field, and found to be accurate to within 0.003, while all the Edwards Balances used were checked for the previous report made to this Association, and found to be very accurate.

In these tests (see Table 1 for test data) we have attempted to establish at just what gravity the error incurred by transportation of samples, and by use of a drier, becomes apparent. An effort has also been made to determine as nearly as possible what error can be expected.

Attention is particularly called to test number eight. A large drum was filled with this gas and taken to the laboratory, where samples were run off each morning for three consecutive days, with the above results. After the third day there was no noticeable change in gravity. It is worthy of mention, however, that a test made about 2:00 p. m. on the second day showed a slight increase over that taken earlier in the day. This is attributed to the fact that the drum was in the sun, and the noonday heat caused re-vaporization of a portion of the condensate.

On test number ten no error was shown. It is quite probable that this was due to the usual trouble in getting an accurate gravity of storage tank vapors. This is quite a problem within itself.

PORTABLE BALANCE TEST FAVORED

These tests seem to show clearly that gravity tests made after some of the heavier vapors have been permitted to condense from the gas, are not accurate. Gases of a gravity of 0.80 or more, and more than 1 G P.M. seem to be appreciably affected. It is believed that the tests demonstrate beyond question that the more accurate and dependable procedure in taking gravities is to use a portable balance. Set the apparatus up at the meter, and weigh the gas in the exact state in which it is passing through the orifice plate. This does not, as might be expected, necessitate the carrying of a lot of delicate equipment. The gas balance is not an instrument likely to become broken if handled with ordinary care. And with the "U" Gauge, Aneroid Barometer and vacuum pump—all of which are easily transportable—there is little more to carry.

Another method is suggested which might be quite all right. This consists in the use of a stationary balance installed in a temperature controlled room. The samples, when brought from the field, would also be kept in this room until they were run. Considerable argument could be advanced in favor of this method, not the least of which is that a standard mercury barometer would be accessible at all times, so that any sudden change in atmospheric conditions would be noted. As a time saver, though, it could not be recommended. If time is taken to properly steam out, or dry with air, the bombs after each time they are used, it will probably consume more time and labor than the portable method. Expense of building and maintaining the room would be considerable, and keeping a supply of bombs on hand is no small item. They seem to have a habit of disappearing in large numbers.

7th Annual Meter Short Course *at* Ames, Iowa

ONE hundred and forty-nine men registered for the Seventh Annual Meter Short Course held at Ames, Iowa, December 6 to 9, under the auspices of the Mid-West Gas Association and the Engineering Extension Department of the Iowa State College. Of this number 69 were registering for the first time. Severe weather conditions, which practically paralyzed traffic for one day during the meeting dates held the registration much below expectations, though it slightly exceeded former years.

The Course this year was divided into three sections. Section "A" was for those who wanted shop practice under the direct supervision of meter experts. Section "B" was on distribution subjects. Section "C" was for those interested in gas production.

Geo. A. Lane, superintendent of meters for the Peoples Gas, Light and Coke Company, Chicago, supervised the meter work of the Short Course and gave a number of lectures.

R. L. Klar, engineer for the Des Moines Gas Company, Des Moines, Iowa, and chairman for this year's Short Course committee, sends *Western Gas* the following highlights on papers presented.

"Touching upon problems that are now pressing the gas industry as important were papers on 'High Pressure Distribution', by H. G. Ford, Aurora, Ill.; 'The Theory of Combustion', by R. H. Luscombe, industrial engineer; 'Water Heating', by S. E. Edge, Des Moines, Iowa; 'House Heating', by J. D. Preble, Chicago; 'Tar Emulsions', by Cameron C. Barr, Des Moines; and 'Utilization of Steam', by C. T. Williams, Sioux City, Iowa. The high spots in the above discussions, briefly stated, were as follows:

HIGH PRESSURE DISTRIBUTION

"High pressure distribution is the coming method by which gas companies will use to the utmost limit money invested underground. That this kind of distribution is practical and safe and has been used long enough by the pioneers to be no longer an experiment is certain.

THEORY OF COMBUSTION

"The theory of combustion paper and discussion evoked great interest. Industrial gas is to be the field of gas men's endeavors and it is up to gas men to understand the theory of combustion to the end that they may be able to tell manufacturers the way to build what they want so as to sell both the appliance and the gas.

HOUSE HEATING

"Technicalities of house heating were presented in the paper on that subject. Preliminary surveys of the territory and careful analysis of the house heating loads were presented as prime requisites prior to a company deciding to go after house heating through the making of attractive rates for gas. Many companies have reduced their rates to get business and later found that the actual getting of business was done at a loss. It is easier to reduce rates than to increase them and the embarrassment of finding that house heating has been taken on at an unprofitable rate is something to be religiously avoided. The paper brought out that the house heating load is ours and can be had at a profitable rate. It is therefore important that the preliminary studies cover all angles of the situation and should be entered into by the sales force, the engineering force and the accounting or rate-making force on equal footing.

TAR EMULSIONS

"Tar emulsions are as troublesome today as ever. While there are many advocates of intensive research on the causes of tar emulsions, methods of coping with the disposal of emulsions are the primary desire of the great majority. There has been developed a steam still which does this at a very small expense, less than one-quarter of a cent per gallon of emulsion treated. Centrifuge machines have also done good work. As to the prevention of formation—high heats, large separators, clean machines and careful separation of the condensates are for the most part recognized as helping and are being practiced, but how they tie together and which is the most important phase has yet to be determined.

STEAM UTILIZATION

"Utilization of steam in the gas works developed a fine discussion. Granting economical production of steam is only the first step, steam can be and is being produced at low cost in gas works today. This condition has come about within the past twelve years. The utilization of steam has come in for study and the over-hauling at regular intervals of all prime movers has for some years been recognized as good practice. This practice, however, has not been taking us far enough and we will not have reached the maximum efficiency until we can run through the year accounting for all the steam made. There are many plants today where exhaust pipes no longer throw steam to the atmosphere. The use of exhaust steam accumulators, condensing apparatus, holder

heating with hot water, etc., can be so tied in with the running of the prime movers that a perfect balance seems quite possible. Especially is this true when a steam accumulator is used in conjunction with heating holders with hot water. The holders present a tremendous heat storage and furnish the antifluctuator for the entire works."

HIGH YIELD FOR TALLANT GASOLINE PLANT

Empire Gas & Fuel Company's gasoline plant at Tallant, in Osage County, Oklahoma, established a record on December 10, when it recovered 21,919 gallons of gasoline from 75,000,000 cubic feet of gas handled on that day. Harry A. Ells, formerly superintendent of construction for the gasoline division of the Empire, has recently been promoted to superintendent of the Tallant plant.

HOOKINS IS PRAIRIE TREASURER

A. B. Hookins has been elected treasurer of the Prairie Oil and Gas Company, succeeding the late E. T. Patterson. Mr. Hookins was formerly comptroller and assistant treasurer of the company.

SUPPLY FIRMS MERGE

The American-La France Fire Engine Company, Inc., of Elmira, N. Y., has purchased the Foamite-Childe Corporation, of Utica, N. Y., and the two companies are being combined under a single corporate concern, the American-La France and Foamite Corporation.

PHILLIPS CARBON PLANT

Phillips Petroleum Company is building a carbon black plant in Gray County, Texas, for the purpose of marketing a portion of the residue gas from its gasoline plant on the Riley lease in Block B2. Work of clearing ground for the plant was started early in December.

GAS FOR CEMENT PLANT

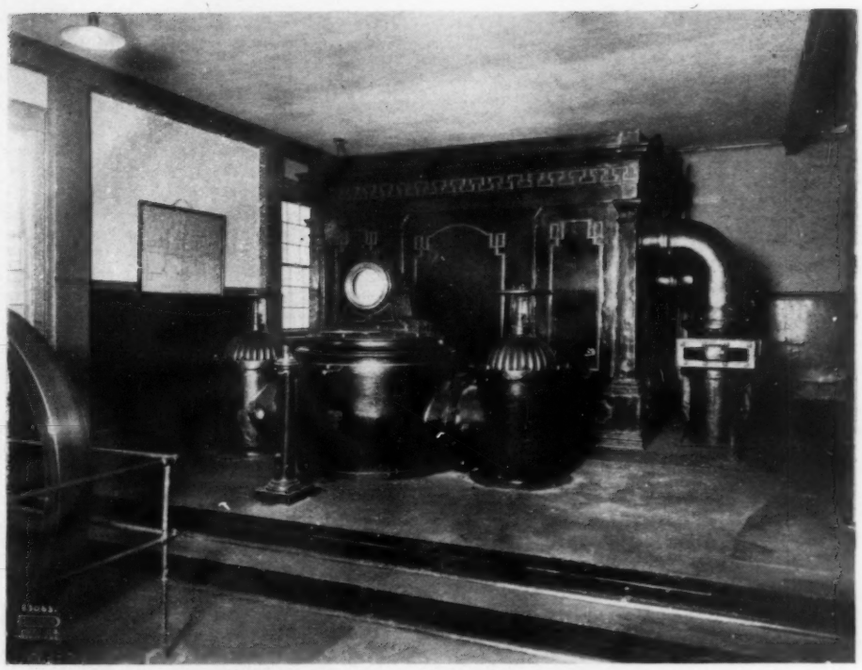
Colorado-Wyoming Gas Company has closed a contract to supply the new Ideal Portland Cement plant at Fort Collins, Colo., with gas fuel from the gas field 17 miles north of Fort Collins.

SOCIETY OF GAS LIGHTING ELECTS OFFICERS

The fifty-second annual meeting of the Society of Gas Lighting was held at the Hotel Astor, New York City, on Thursday, December 8, 1927. The following officers were elected: President, W. Cullen Morris; vice-president, Alfred E. Forstall; treasurer, William J. Welsh; secretary, George G. Ramsdell; member executive committee, J. Arnold Norcross; finance committee, Edw. C. Uhlig, chairman, George H. Scranton, and Oliver H. Smith.

NATURAL GASOLINE OUTPUT HIGH IN SEMINOLE

The five Seminole pools with 37 completed gasoline plants have a daily average yield of 804,000 gallons of gasoline. A number of plants are operating in the Bowlegs pool, recycling the gas. Sinclair Oil & Gas Company is leading with a daily run of around 280,000 gallons, Carter Oil Company second with 184,000 gallons, and the Indian Territory Illuminating Oil Company third with 103,000 gallons. Crosbie & Morgan, Barnsdall, Independent, Magnolia, Pure Oil Company, Roxana and Forrest E. Gilmore are among the other producers of natural gasoline in the Seminole territory.



New rotary meter installed by British Columbia Electric Company

Gas Use Gains *in* Vancouver, B. C.; Many Equipment Additions Made *in* 1927

THE consumption of gas in Vancouver B. C. has greatly increased during recent years. Ten years ago gas sales, together with revenue from coal tar, ammonia, and gas appliance sales amounted to $344,000. In 1927 the revenue was approximately $1,500,000. Ten years ago 13,760 customers were served with gas by the company; today 36,484 customers are on the company's books.

The daily output of the gas plant during the past year was 5,000,000 cubic feet. The miles of mains laid at the end of 1927 were approximately 368, and it is anticipated that during 1928 additional miles will be laid at an average rate of five miles per month.

At present negotiations are in progress between the company's officials and North Vancouver civic authorities for the supply of gas to that city. As North Vancouver is located on the opposite of Burrard Inlet to the city of Vancouver, and is a considerable distance away by road this would involve a large expenditure and considerable amount of work. Officials of the gas department of the B. C. Electric have made an offer to North Vancouver to establish new holders on the north shore and to lay approximately 15 miles of mains in the city within one year.

John Keillor, gas engineer of the company, is at present making a business trip to New York and London in connection with plans for erection of a new water gas plant and new holders.

A considerable amount of new equipment has been installed in the gas plant of the British Columbia Electric Railway Company at Vancouver, B C., during the past year.

Installation of a new rotary meter has just been completed at the meter house. The meter is four feet six inches in diameter and seven feet high, with 20-inch diameter inlet, outlet, and by-pass connections, and takes up about one-tenth of the space required by the wet type of station meter of the same capacity.

It consists of an outer case iron case, containing a partition plate dividing the inlet chamber from the outlet, and is supported by a base box. This case is surrounded by a hood, containing the index, from which registration is read hourly. The interior consists of a fan wheel, containing a series of vanes set at an angle of 45 degrees, and is carried on a vertical shaft jewelled at top and bottom to reduce friction and prevent wear and tear.

The stream of gas passing through the instrument is broken up by a series of vertical guides and auxiliary tubes in order that the gas may be distributed equally over the vanes and thus render them sensitive to the passage of small quantities of gas. The revolutions of the fan are communicated by the center shaft, through the medium of a worm wheel which forms the recording apparatus.

In the lower part of the measuring apparatus is fixed a diaphragm valve which is intended to prevent any backward flow of gas, and when small quantities of gas are flowing through the meter this acts as a spreader, directing parts of the current through the auxiliary tubes to the vanes and rendering them exceedingly sensitive to the main body of gas. A small center tube contains a dash pot which is inserted to prevent any possible dancing of the valves. With friction reduced to a minimum, the momentum acquired by the fan-wheel would tend to keep it in motion after the gas had been shut off, and to prevent this a brake is inserted which automatically comes into action on the fan wheel when the meter ceases to pass gas.

Unlike the ordinary type of meter, the interior of the rotary meter may be easily removed for inspection and cleaning. The capacity of this meter is 100,000 cubic feet per hour, and the registration is accurate when passing not less than 10,000 cubic feet per hour, or more than 100,000 cubic feet.

A set of water cooled condensers for the existing horizontal benches has also been

added at the B. C. Electric gas plant. This set has a capacity of two million cubic feet per day.

A rotary scrubber with a capacity of two million cubic feet per day has been installed, together with one P. & A. Tar extractor of same capacity, complete with all connections to existing water gas plant and horizontal benches.

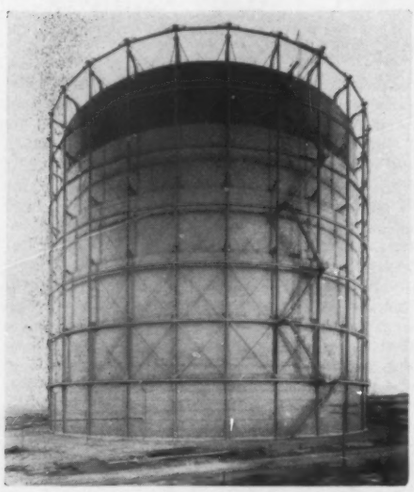
Two high pressure gas compressors with reinforced concrete house have now been erected at the Grandview Holder Station of the company and will be used for service on the 12-mile high pressure line connecting New Westminster, South Burnaby and a portion of South Vancouver.

A further addition to the Grandview holder station is a Sturtevant booster with 200,000,000 cubic feet capacity for service in the districts of Grandview, Mount Pleasant, Kitsilano, Point Grey and the University area during peak hours of demand.

The old 12-inch station governor has been removed from the booster house to a new structure erected at the Grandview holder station, and a 24-inch governor also installed at this new booster house.

A new bucket type of elevator with bunker and reinforced concrete pit has been erected to serve the briquette plant of the company.

An entirely new steel stiff leg derrick has been erected at the Keefer street plant, to be used in connection with the coal bunkers, and will facilitate unloading coal scows, and feeding the carbonizing plant.



New gas holder at Long Beach, Calif., 10,000,000 cu. ft. capacity

LONG BEACH GAS HOLDER IS COMPLETED IN RECORD TIME

ON May 5, 1927, the City of Long Beach Calif., awarded a contract for the construction of a 10,000,000 cu. ft. gas holder to the Stacey Brothers Gas Construction Company of Cincinnati, Ohio. During the second week in December last, the construction firm turned the completed holder and compressor station over to the city, thereby setting up a new time record for the erection of a holder of this capacity. Time allowed for its completion was eight months, and the work was finished in seven. Cost of the holder was $619,820. William A. Miller, chief engineer for Stacey Brothers, was in charge of the Long Beach project.

The holder is of the water tank type, consisting of five telescopic lifts. Work commenced on excavation for the concrete foundation on May 6, the foundation measuring 272 feet six inches in diameter. This was complete on May 28. Erection of the steel work began on June 13, and was finished, with the exception of part of the painting, on November 28, five and one-half months from date of starting.

The water tank and the five lifts or sections of the gas holder are constructed of steel plates of varying thicknesses (a maximum of 2-$\frac{3}{32}$ inches) and steel structural shapes, all securely riveted together. The guide frame, 245 feet in height, consists of 28 columns, each constructed in six sections, two being 18-inch, two 20-inch, and two 24-inch eye beams, with a 15-inch eye beam on front chord of column, and extending its full height. The columns are connected together by six tiers of double 15-inch channels, forming horizontal girders, and braced with eye bar diagonals, all constructed to resist the pressure exerted by a windstorm having a velocity of one hundred miles per hour.

Foundation concrete for the holder was laid on top of a hard dry clay soil, which was submitted to a test load of 12,000 pounds on one square foot for 24 hours, without showing any appreciable settlement.

Each unit of the 12-compressor installation has a capacity to discharge 80,000 cubic feet against a pressure of 30 pounds, the maximum maintained on the high pressure distribution system of the city gas department.

Completion of the holder ahead of schedule was a fortunate circumstance for Long Beach, for cold weather which set in on December 9 brought a 25 per cent jump in gas consumption. The increased demand has been satisfactorily met with the aid of the new facilities. Walter R. Fleming, Public Service Director for the city of Long Beach, addressed a highly commendatory letter to Mr. Miller of the constructing firm, complimenting him upon early completion of the project without injury either to workmen or property during construction.

Formal acceptance of the completed gas holder by the city council came on December 13. By terms of the contract entered into between the city and Stacey Brothers a penalty of $500 a day would have been exacted by the city for each day over the contract period during which the holder remained uncompleted and unaccepted.

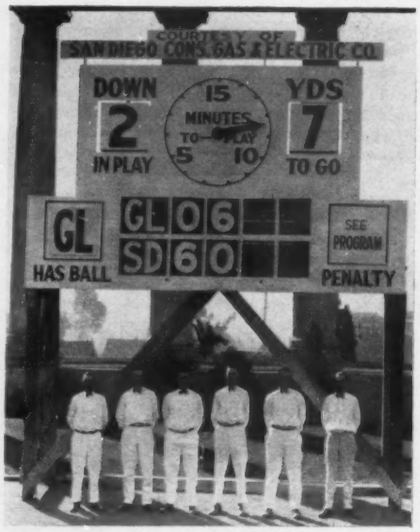
A 500,000 cu. ft. gas holder is now under way by Stacey Brothers Gas Construction Company for the Tucson, Ariz., Gas and Electric Company, and the same firm recently erected a 2,000,000 cu. ft. holder at Stockton, Calif, for the Pacific Gas and Electric Company.

DEATH CLAIMS KLOMAN

Chas. R. Kloman, late advertising manager for C. F. Braun & Company, Alhambra, Calif., died November 28 at the Navy Hospital, Mare Island, Calif. Mr. Kloman was 27 years of age and a graduate of Annapolis. He was formerly with Smith & Ferris, advertising agency of Los Angeles.

WASKOM GASOLINE PLANT

The Moody-Seagraves interests have completed plans for a $125,000 gasoline absorption plant to be erected at Waskom, Texas, and contract has been awarded to C. F. Braun & Company of Los Angeles. This plant will be near the booster station of the Dixie Pipe Line Company's 22-inch Webster Parish-Waskom-Houston gas line to have an 80,000,000-foot capacity daily. Approximately 15,000 gallons of gasoline per day is figured to be taken by the new plant. The plant was expected to be operating by January 1.



Mechanical scoreboard erected by San Diego Consolidated G. and E. Co.

A Good Will Getter!

SOMETHING unique in the way of a good will publicity getter for a public utility company has been conceived by the San Diego Consolidated Gas and Electric Company in the mechanical scoreboard shown above. This board was designed and erected by the company for use during the big naval football classics held for the Pacific Fleet championship, in San Diego, December 3rd and 4th last.

A field telephone system was installed in connection with the board to assure prompt and accurate posting of team positions and plays. Its operators were all employees of the San Diego Consolidated's record department. Left to right, in the picture above they are: R. C. Brown, Jack Brown, Bill Garber, Forrest Raymond, Les Kobler and Ray Cavell, superintendent of the department and designer of the board.

Operation of the board brought general commendation to the company from football fans, from the newspapers, and even over the radio.

TWO MORE LINES

The Jensen Instrument Company, Los Angeles, has been appointed exclusive representative in California and Arizona for two additional lines of equipment. Gillfilan Machine Works, Ebenezer, N. Y., makers of automatic gas fuel boiler regulators, pressure reducing valves, casinghead regulators, etc., is one of the new Jensen accounts, and the other is the Badger Meter Manufacturing Company, Milwaukee, Wis., which for the past 25 years has manufactured a line of disc, turbine, and compound water meters, also hot water, oil and gasoline meters.

CHULA VISTA OFFICE

The sixth district office and appliance store of the San Diego Consolidated Gas and Electric Company was opened at Chula Vista, Calif., on December 15. J. W. Devereaux, manager of the Merchandising Division of the Byllesby Engineering and Management Corporation, was present to officiate at the formal opening, which was attended by over 1,000 people. George P. Winn has been appointed district agent at Chula Vista. The San Diego Company now conducts district offices at La Jolla, Coronado, Oceanside, Escondido, La Mesa and Chula Vista.

Natural Gasoline By-Products *to* Enrich Water Gas

(Continued from page 27)

introducing the new enricher as a gas into the lean gas.

The water gas set[2] was operated in the normal manner, using West Virginia coal as generator fuel, making the usual blow runs, but gas oil was not admitted to the carburetor although the blast gas was largely burned therein as usual. The lean gas comprising mixed water gas and blow-run gas was conducted directly to the relief holder uncarbureted. This lean gas was subsequently enriched while still warm at the outlet of the relief holder, from which it was withdrawn quite uniformly by the works exhauster, by the introduction of the gasified gasoline using approximately 9.2 per cent of the latter by gas volume in the production of 565 B.t.u. gas.

The gasoline was used directly from a tank car in which it was under 35 pound pressure. The liquid was withdrawn under its own vapor pressure and caused to pass through pressure reducing regulators, through a vaporizer wherein it was gasified, through an orifice meter and the pipe line connecting it with the lean unpurified gas. The vaporizer used comprised a simple and small, metal-tube heat exchanger in which some of the hot water overflowing from the condenser was the heating medium. The latent heat of vaporization of the gasoline was low as shown in Table 1, hence the high capacity of a small heat exchanger. The hook-up used at Muscatine is substantially and diagrammatically as shown in Figure 1.

A Parr recording calorimeter was used and also a Sargent calorimeter in determining the heating value of the gas. Analyses were made of the lean and of the carbureted gases. In Table 3 the composition and calorific values of these gases are shown.

Table 3.—Showing the composition and calorific value of the finished, butane-carbureted gas and of the lean gas as made at Muscatine, using West Virginia coal as generator fuel.

	Finished gas*	Lean gas	
		Mixed blue gas and blow run gas.	
CO_2	7.72	8.6	8.6
Illuminants	.88	1.4	1.0
O_2	.40	.0	.1
CO	22.62	26.4	25.5
H_2	29.00	32.7	32.7
CH_4	6.30	5.1	7.1
Butane (enricher gas)	9.18	.....	.....
N_2	23.90	25.8	25.0
Calculated B.t.u.	567	.....	.....
Actual B.t.u as shown by calorimeter	565	.....	.....
Specific gravity	0.814) determined)		

*Some air was added at the exhauster (common practice at this plant) for the purpose of aiding purification.

RESULTS

The main report of this investigation which will be a forthcoming publication of the Bureau of Mines will present in more detail the calculations and results of this study. For the purposes of this report the following summary and conclusions which in part allude to the more complete report and which represent in substance the summary and conclusions of the latter, will probably suffice as a statement of results.

2.—This work was done, through the courtesy of the officers of the United Light and Power Company and the assistance of their engineers, at Muscatine, Iowa.

SUMMARY AND CONCLUSIONS

As a result of a study of some of the important properties of the highly volatile members of the paraffine series particularly those properties pertinent to the generation, distribution and utilization of manufactured gas and as a result of the commercial production of carbureted water gas for a brief period only in a small gas works, using these hydrocarbons as enricher it seems that some quite definite conclusions are justified relating to the possibilities in the commercial utilization of these materials for such a purpose. The following summary is made along with certain conclusions some of which latter may require some modification which is not apparent now and which may become evident after prolonged usage of the new enricher.

One grade of G. E. Gasoline comprising chiefly a mixture of normal and iso-butane, but containing approximately 5 per cent of propane and 2 per cent of pentane was used on a commercial scale in the production of carbureted water gas having a calorific value of 565 B t.u. per cubic foot, the gasoline entirely replacing gas oil, and it was noted that:

(A) There were no complaints of service or quality of gas supplied the consumers.

(B) The quality of the gas made and distributed was readily maintained at the approved standards.

(C) As indicated by the calorific value of the gas at points distant from the gas works the condensation in the mains and distributing system was nil. As a matter of fact this observation was partly obscured since the calorific value of the gas at these outlying points was appreciably higher than that of the gas sent out from the gas works; this difference obviously being due to a removal from the distributing system of accumulations of condensed matter including naphthalene, which would logically follow as a result of the difference in the partical pressures of naphthalene and the like in the two kinds of carbureted gas, namely the gases made using gas oil and using the gasoline as enrichers. Prolonged operation using G. E. Gasoline may show that there is a certain amount of condensation in the distributing system, but it is evident that under normal conditions the amount of this condensate will be small and it will not comprise propane, butane and pentane.

(D) The candle power of the finished gas (enriched with G. E. Gasoline) as revealed by mere observation of the gas when burning from a flat-flame burner-tip was somewhat lower than that of ordinary carbureted water gas of the same calorific value when similarly burned. A photometer was not available for making this test but it is believed and appears to be true that this difference in luminosity of the flat-flame jet is of little if any importance in the manufacture of city gas.

(E) The specific gravity of the finished gas distributed during the operation with G. E. Gasoline was rather high being 0.76 to 0.82. However, in this connection it will be noted that it has been the practice at this plant to distribute gas containing a high percentage of inerts—CO_2+N_2—taking advantage of the economies resulting from the use of the blow run, the density of this gas normally being higher than in those plants making either mixed coal gas and water gas or carbureted water gas containing a lower percentage of inerts. Calculations have been made showing that the density of finished, carbureted water-gas using G. E. Gasoline as enricher need be only slightly greater than that made in the regular way using gas oil, other factors remaining the same.

(F) The composition of the lean gas (mixed blow-run gas and water gas) and of the finished gas made during these tests is shown. In this connection attention is called to the fact that the lean gas was made in a hand operated carbureted water gas set, with a generator-shell 5 feet 6 inches in diameter, using Boone Chilton coal. Approximately 9.2 per cent of G. E. Gasoline (gas) was required in the finished gas carbureted to 565 B t.u. per cubic foot. This is a smaller volume than that of the oil gas resulting from cracking the gas oil used in the ordinary carburetion of water gas, therefore a greater amount of lean gas must be made per M. of finished standard gas when using G. E. Gasoline than when using gas oil; this results in a direct decrease in gas-making capacity unless operating changes are made to "offset" this difference. In the early part of the operation at Muscatine, Iowa, no such changes were attempted and the capacity was accordingly reduced approximately 10 per cent, but subsequently the gas making capacity was raised above normal with satisfactory results.

(G) A small amount of tar—in this case, coal tar—was produced in the operation of the water gas set, the duration of the tests being too short to measure accurately the quantity which obviously must be very small. It was noted, however, that the tar formed had a high specific gravity and settled readily from water without exhibiting a tendency to form emulsions.

(H) The generator fuel per M. of carbureted gas made increases substantially in proportion to the increased amount of blue gas in the finished product. In some of the tests the increase was a little more than this amount for reasons which were evident and could not readily be avoided. Operating data including the fuel used per M. are shown.

(I) The water gas set was operated in the regular manner making water gas and blow-run gas, but enricher was not introduced into the carburetor; lean gas was conducted to the relief holder and vaporized G. E. Gasoline was introduced into this gas at a uniform rate as it was withdrawn from the holder. The blast gas was almost entirely burned in the usual manner in the checker chambers by the introduction of secondary air causing the temperature at the base of the superheater to rise to 1800° F. and that at the top of the carburetor to reach approximately 1900° F. It was believed that at such temperatures much of the tar liberated by the coal during the gas making period would be cracked and gasified. In fact it seems that at 1800° to 1900° F. some of the carbon from the tar and from any blown-over fuel should combine with steam (always present in excess in generator gas) by the water gas reaction. The extent to which this actually happened is obscured by the lack of uniformity in the lump size of the coal used.

(2) Calculations have been made to show the amount of G. E. Gasoline required per M. of finished gas having calorific values varying from 475 to 600 B.t.u. per cubic foot using the blow run to the extent of zero to 30 per cent. Graphs showing these relations and the density of the finished gas are shown for 2 grades of G. E. Gasoline. (See Figure 2.)

(3). The most satisfactory method of introducing G. E. Gasoline into the lean gas for carbureting purposes will depend somewhat upon plant conditions; a few simple means for accomplishing this have been shown and discussed.

(4). Calculations indicate that substantial economies can be made in the manufacture and distribution of carbureted water gas by the substitution of G. E. Gasoline (cold carburetion) for gas oil at the same price as gas oil; these economies include:

(a) A decrease in the consumption of enricher per M. of gas made resulting from the higher calorific value per cubic foot of G. E. Gasoline gas than that of the gas resulting from the cracking of gas oil.

(b) A decrease in the consumption of enricher per M. of gas made because of decreased condensation in the distributing system; the gas as made with G. E. Gasoline can have a calorific value 10 to 15 B.t.u. per cubic foot less at the gas works than the ordinary carbureted gas of a given standard without altering the quality of the gas as supplied to the consumers at distant points.

(c) A decrease in the cost of purifying raw gas because of the decreased amount of napthalene and tar and possibly of sulphur compounds present. In small plants where oxide is frequently prematurely discarded because of the presence of an excessive amount of tar, the "life" of the oxide and its capacity for removing H_2S should be increased when using the new enricher. The G. E. Gasoline used in the tests was free from H_2S and contained 0.5 grains of organic sulphur compounds per 100 cubic feet of vapor. With this quality of enricher comprising paraffin hydrocarbons it is possible not only to make a gas which is substantially free from sulphur compounds (organic and inorganic) but the gas should be equally devoid of the gum-forming and resin-forming compounds which have been so annoying in many gas plants in recent years.

(d) An increase in the amount of available waste heat which can be utilized in heat economizers or by a modification of the operating method such as by the use of back run.

(e) A decrease in the expense resulting from the checkering of the carbureting chambers.

(f) A decrease in the cost of handling and caring for complaints of service resulting from naphthalene stoppages and the like.

(5) Some of the important items relating to the cost of manufactured gas have been discussed herein. It is recognized that normally the chief items tending to increase the cost of the finished gas are a decreased credit from the sale of tar and an increase in the generator fuel requirements. The cost of storing G. E. Gasoline, and it must be stored under pressure, is an item to which an approximate value has been assigned. In some plants where the gas-making capacity is reduced a proportional increase in the direct gas-generating labor will result. In spite of these facts it is believed that the net result of the change from gas oil to G. E. Gasoline as enricher at a common price will be an economy in the average gas works. In making the latter statement it is recognized that in some plants, namely those in which high oil-gasification efficiency is obtained, in which the tar and drip oil are sold at a high price and which are well equipped for the removal of tar, naphthalene and H_2S, it may not be an economy to use G. E. Gasoline at the same price as gas oil.

(6) The properties of G. E. Gasoline and of the individual low-boiling hydrocarbons of the paraffin series are discussed and graphs are presented showing the vapor pressure-temperature relations. Attention has been called to the fact that consideration must be given to the properties of G. E. Gasoline when unloading, pumping, storing and using it. In visualizing the nature of this product it may be likened to water stored in a tank at a temperature above its boiling point under pressure—being a gas at ordinary temperatures and pressures.

(7) In making comparisons in this paper it has been assumed that the average oil-gasification efficiency in gas works practice is equivalent to 100,000 B.t.u. per gallon of gas oil. With a good grade of gas oil a higher efficiency than this is sometimes obtained; in many of the small plants the oil-gasification efficiency is lower than this. It is believed probable that with an increasing amount of oil cracking in the production of gasoline the quality of oil available for the generation of gas will be of such a quality that it may be difficult to obtain results as good as 100,000 B.t.u. per gallon. With this in mind, in view of the general trend in the price of gas oil over a period of years it appears that the economies possible in the substitution of G. E. Gasoline for gas oil at a common price will increase with time. Of the two grades of G. E. Gasoline considered herein, one comprising chiefly propane and butane in equal liquid volumes, yields approximately 101,700 B.t.u. per gallon to the gas, the other comprising chiefly butane yields approximately 106,100 B.t.u. per gallon.

(8) Data are presented showing the annual march of prices of crude oil and gas oil in the Mid-continent field for a period of years. The amounts of natural gas and natural gas gasoline produced and recovered annually in the United States for a period of years are shown affording a means for visualizing approximately the possible and probable production of G. E. Gasoline in this country from this source. Petroleum technologists state that a large production of low boiling hydrocarbons will result from and accompany the more extensive use of cracking processes in the production of gasoline.

(9) In the experimental operation at Muscatine, Iowa, the G. E. Gasoline was introduced into the lean gas in the gaseous state, a simple, small, tubular heat exchanger being used to vaporize the gasoline, hot water from the condenser being the source of heat. It will be noted that the latent heat of vaporization of G. E. Gasoline is low and therefore a small amount of heat only is required for its vaporization.

ACKNOWLEDGEMENTS

Grateful acknowledgement is made for helpful suggestions offered by Messrs. G. G. Oberfell, Director of Research of Phillips Petroleum Company and O. P. Hood, Chief of Technologic Division of the Bureau of Mines. The hearty cooperation of the officials and representatives of the United Light and Power Company was appreciated; their engineers and chemists actively assisted in the experimental work. Messrs. R. W. Thomas and F. J. Harlow of the Research Staff of Phillips Petroleum Company also actively and helpfully assisted in this work. Appreciation is also expressed for the service rendered by Professor Parr who at his own expense installed the Parr recording calorimeter which was used throughout the tests.—Reports of Investigations, Bureau of Mines, Department of Commerce.

Table 4.—Properties of three grades of gas enricher produced by Phillips Petroleum Co.

	GRADE 1	GRADE 2	GRADE 3
Vapor Pressure Lbs. per Sq. In. gauge			
at 70°F	33	70	120
at 90°F	50	100	165
at 100°F	60	135	195
at 130°F	100	185	300
Boiling Point at 14.7 lbs. per sq. in. absolute	+15°F	−19°F	−42°F
Specific gravity of liquid (water=1)	.577	.55	.515
A.P.I. gravity of liquid	114	126	143°
Weight per gallon of liquid	4.8	4.58	4.24 lb
Specific gravity of gas (air=1)	1 95	1.77	1.55
Cubic feet of gas per gallon of liquid	32	33.8	36
Heating Value			
B.t.u. per cu. ft.	3,190	2,910	2,550
B.t.u. per lb.	21,350	21,450	21,600
B.t.u. per gallon	102,400	98,300	93,000
Latent Heat of Vaporization at Boiling Pt.			
B.t.u. per lb.	170	177	183
B.t.u. per gallon	830	810	790
Specific Heat of vapor (Cp)	.46	.465	.475
Dew Point at 14.7 lbs. absolute	+26°F	+10°F	−45°F
Temperature at which pressure is 0 lbs. per sq. in. gauge	+15°F	−20°F	−45°F

These properties are approximate only and can be readily varied to meet exact specifications or customers' requirements, by slight changes in the composition of the various grades.

Author's note: The gasoline designated as Grade 1 above is substantially like that used in the large scale tests at Muscatine, Iowa. In the calculations upon which Figure 2 is based, the calorific value of the gasoline vapor and the yield of vapor per gallon of liquid are assumed to be somewhat higher than the figures given in the above table.

Oil Absorption *of* Natural Gasoline

(Continued from Page 32)

an initial ethane concentration, expressed as ratio of ethane to permanent gases, of 10 per cent, propane of eight per cent, butane of five per cent and pentane of two per cent. Assume furthermore that the absorber is so designed and operated as to dissolve half the butane, using an amount of absorber oil such that the rich oil leaving the absorber is 90 per cent saturated with butane. This determines the butane operating line, shown as a dotted line in the figure. Its left hand end must lie at 2.5 per cent, since this is half the butane in the original gas. Its right hand end must lie at $x = 5.1$ per cent, since at the butane concentration in the rich gas equilibrium with the liquid would correspond to 5.7 per cent. It will be noted that the driving force causing absorption of butane is large at the lean end of the diagram and small at the rich end. Remembering that in the case of each component, the average distance between its operating line and equilibrium line (the driving force) times the effective area of interphase contact times the coefficient of absorption must equal the amount absorbed, it will be clear that in taking the ratio of these expressions for any two components the contact area drops out and consequently when the operating line

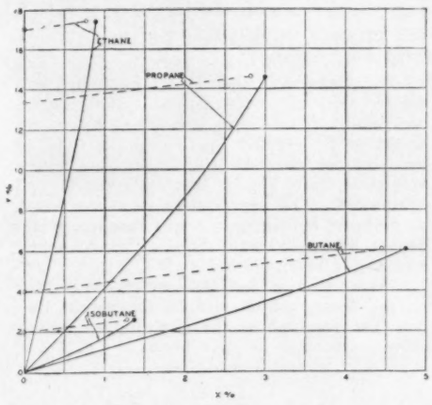


FIG. 2.

for any one component is determined, those for all others are all fixed. Thus, in Fig 1 the operating line for ethane must be parallel to that for butane and must lie entirely to the left of the ethane equilibrium. Obviously, therefore, it must be the dotted line shown for ethane and its right hand end must, so far as ethane is concerned, correspond to substantial equilibrium between liquid and gas at the rich end of the absorber. Practically, the same is true for the propane operating line, though here, because more propane is dissolved, the right hand end will not come quite so close to the equilibrium curve. It should be noted that in both these cases the driving force is small at the rich end of the absorber and large at the lean. When, however, one comes to pentane the situation reverses. Remembering that the pentane operating line must be parallel to the others, and yet lie to the left of the pentane equilibrium, it is obvious that this line must be one corresponding to quite complete absorption of pentane from the gas, as shown by the dotted line on the diagram. Furthermore, it is impossible for the pentane to be anywhere near equilibrium in the two phases at the rich end of the system. In

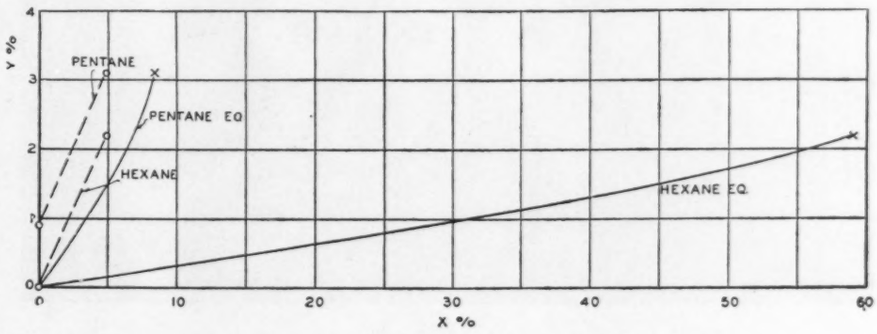


FIG. 2A

other words, for high boiling constituents the driving force becomes very large at the rich end of the diagram but very small at the lean end. This is why it is so difficult to remove completely the high boiling, very soluble constituents from the gas by liquid absorption, despite their solubility. None the less, the less their volatility and consequently the flatter their equilibrium line, the greater the driving force at the rich end and the more nearly completely are they absorbed, i. e., in such cases the operating line starts just above the origin but very close to it.

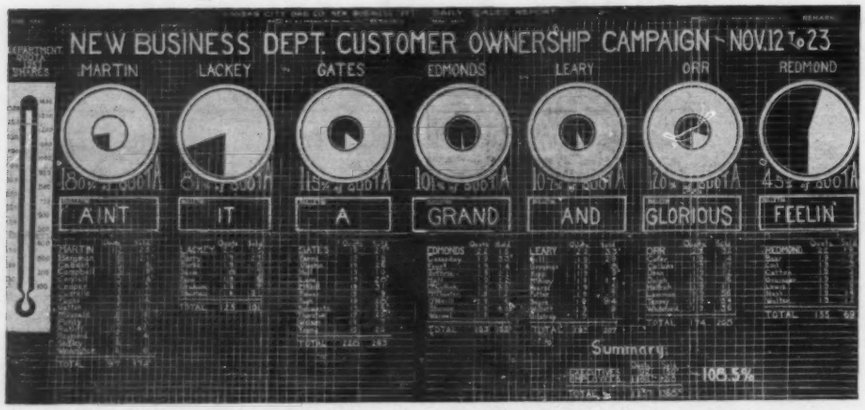
Where one is dealing with a lean gas it is possible at low pressure to establish an equilibrium curve for each component in the system, as has just been done. Where the gas is rich or the pressure high, so that one builds up a high concentration of dissolved constituents in the absorbent liquid, the equilibrium for each component is not a function of the characteristics of that component alone but is influenced by the character and amount of the other soluble components. But at the lean end of the system the equilibrium conditions remain identically those of the preceding case and this disturbing factor becomes effective only at the rich end. In other words, for each component the equilibrium curve starts out at the lean end from the origin with the slope given in the preceding case but the equilibrium begins to deviate from this as concentrations go up. However, the extent of the deviation for each component depends only on the total number of mols of all components dissolved per mol of the absorbing liquid and in any given case this quantity can be estimated in advance with a reasonable degree of precision. This determines one point at the rich end of the equilibrium diagram for each component. Considering that the equilibrium diagram must start at the origin with a fixed slope and must go through one point the location of which is known, the curve can be drawn in with a reasonable degree of precision.

The relationships will best be understood by consideration of data obtained in a test on an operating plant. The effective temperature at the bottom of the absorber was 308° K, and the operating pressure 3.18 atm. absolute. The composition of the raw gas is given in the first column of figures in Table I. The partial pressures calculated from these data are given in the second column. The fourth column is the theoretical concentration of each component in the liquid absorbent on the assumption of equilibrium between effluent rich absorbent and incoming rich gas, calculated from the relation $p = Px$. The fifth column of figures shows the composition of the rich absorption stock as actually realized in this particular plant, expressed in mol per cent. This last quantity, divided by the preceding one for each component, gives the per cent saturation of that component in the absorbent liquid. The mol per cent of absorbent oil in this rich effluent liquid was 83.1. It will be noted that for the first four volatile components the per cent saturation averages 94. The deviations from this mean value are largely due to experimental errors and give an idea as to the order of dependability of these particular data. The per cent saturation of pentane is only 59 and of the higher boiling constituents, assumed to average heptane, only eight. The last two columns, calculated from the preceding data, represent the analysis of the incoming and outgoing gas, expressed as a per cent of the inert gas in the mixture. Figs 2 and 2A represent these data plotted as in Fig. 1. The per cent saturation for all low boiling components has been assumed constant at 94.

This method of approach makes it possible to design absorption units for natural gasoline on a rational basis, strictly comparable with the methods used in the less complicated cases with which the chemical engineer is more familiar. In general, one will design for the recovery of the most volatile component which it is desired to recover in quantity. It will then be necessary to make sure that the recovery of those higher boiling components next in order of volatility is satisfactory, but once this is done there need be no question about the recovery of any components of still lower volatility. Furthermore, the amount of absorption of the undesirable, more volatile constituents can be estimated with precision. This makes it possible to design, not only an absorption unit, but also the supplementary stripping equipment with a precision and dependability hitherto seldom realized. These methods are also directly applicable to stripping operations, it being kept in mind that the operating lines must be on the opposite side of the equilibrium curves.

NORTHWESTERN COMPANIES ARE SOLD BY BYLLESBY INTERESTS

Standard Gas and Electric Company has announced the sale by Mountain States Power Company of the properties of Tacoma Gas and Fuel Company, Olympia Gas Company and Puget Sound Gas Company, the latter supplying the city of Everett, Washington, to interests identified with the United States Electric Power Company of New York, effective December 31.



Blackboard used in customer ownership drive

New Business Men Set Fast Securities Sales Pace

KANSAS CITY GAS COMPANY'S new business department has developed a habit of winning that utility's intra-company customer ownership contests, and some of the methods followed by this live commercial branch in the company's most recent securities sales effort, concluded in December, are worth noting. With only 12 per cent of the company personnel in the department the new business staff, headed by A. W. Baker, the department manager, was given one-third of the entire company quota, went over this quota first, and exceeded it with the greatest percentage of quota sold—108.5 per cent, or 1368½ shares.

Every known "pep" device was worked to the limit by the new business men to keep themselves at top speed. There was a general department meeting each morning of the campaign, to get reports of the preceding day. An old "barroom type" piano was used to good advantage at these meetings, and each of the several crews conceived its own parody to the quota song sung at the morning meetings.

Individual salesmen reported their luck at each morning meeting, and those with 25 or more shares to their credit for the day preceding received the privilege of standing on the table and making a speech. There were several table spokesmen during the campaign. On the closing day of the sales drive, when the department went over its quota by a safe margin, a specially imported ambulance siren went into action for a fitting finale to the occasion.

The blackboard used in this successful customer ownership campaign is shown above, and is practically self-explanatory. Each of the seven crews was given a quota and every member of each crew was given an individual quota, the total of all combined equalling the department quota.

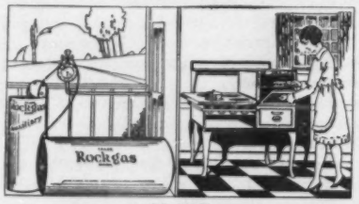
The standing of each crew was reflected daily by circles at the top of the board. These were filled in in proportion to the quota sold. Small circles in the center showed percentage over quota sold.

Under each crew is shown a panel which was used for daily bulletins, to comment on an automobile race that was run in connection with the blackboard. Each crew supervisor was given a high powered racing car that moved around the track, its progress determined by the portion of quota sold. The low crew was represented by a very dilapidated Ford. This race track was on canvas painted in bright colors and all crews watched the progress of their car with interest.

The lower half of the board shows each member of the department and the individual quota and number of shares sold; it also reflects the number of shares each crew sold during the campaign.

At the extreme left is the department thermometer which gave the percentage of quota sold each day.

Pave the way for gas extension by installing



TRADE
"ROCKGAS"
MARK

in places where natural or artificial gas is not available

ROCKGAS will give temporary service in localities where gas mains are to be laid; also permanent service in the event that lines are not anticipated in the locality of installation. It is a form of pure natural gas and comes in convenient sized tanks of various sizes from a tank holding the equivalent of 3,000 cu. ft., 500 b.t.u. gas and 12x37 in. in size to tanks holding the equivalent of 44,040 cu. ft. of 500 b.t.u. gas, of much larger size. Used in thousands of homes, camps, etc.

Distributors Wanted for Some Sections of California

Write us for full and interesting details

Imperial Gas Co.
1871 Cherry Ave., Long Beach, Cal.

ONE TENTH FOR TAXES

In 1926, according to the Rocky Mountain Committee on Public Utility Infrmation, ten cents out of every dollar paid for gas and electricity was absorbed by taxes.

CALIF. NATURAL GASOLINE ASS'N. JANUARY PROGRAM

In addition to a paper on drilling and production practice, by Francis W. Lake of the Union Oil Company of California, the program of the January 12 meeting of the California Natural Gasoline Association will include two discussions: one on the tentative charcoal test method for determining gasoline content of natural gas, and the other a discussion of the report of the Natural Gasoline Association of America on adopting the Beistle method of determining vapor pressures of natural gasoline. The meeting will be held at the Hotel Alexandria in Los Angeles, at six p.m.

DOHERTY INTERESTS MAKE BID ON ARKANSAS NATURAL GAS CO.

H. L. Doherty & Company interests are reported to have offered $16,000,000 for the Arkansas Natural Gas Company, which operates in North Louisiana, South Arkansas and East Texas. The Arkansas Natural is a Benedict and Trees property.

DISPLAY RESTAURANT RANGES AND INDUSTRIAL EQUIPMENT

The C. B. Babcock Company has opened a permanent display of restaurant ranges and industrial equipment in Los Angeles, located at 2132 Atlantic Street. Roper restaurant ranges, Johnson furnaces and burners, and McKee boilers and burners are included in the display.

MODEL GAS HOME FOR S. F.

The San Francisco Chronicle, the Lang Realty Company and the Gas Appliance Society will all cooperate in putting before the public of San Francisco the model gas home, to be erected and maintained for a limited time as a show place for the newest and most up-to-ate in home furnishing and equipment. Gas appliances and equipment as planned will include a gas furnace, water heater, range, radiant type of space heater and a gas refrigerator.

Construction is to start at an early date on the home, which will be located in Balboa Terrace, one of the city's upper middle class residential neighborhoods.

COAST COUNTIES ISSUES PREFERRED STOCK

First preferred stock of a par value of $400,000 will be on sale by the Coast Counties Gas and Electric Company on and after Jan. 16, 1928, according to an announcement recently made by that company. The stock will be priced at $97 a share, to yield 6.18 per cent dividends payable quarterly. The new funds are to be used for extension and expansion of service and acquiring of new service facilities.

The first of the preferred stock of this utility to be issued was sold in 1915, and dividends have been paid continuously since that time.

In an endeavor to secure as widespread distribution of the stock among consumers and employees the individual sales have been limited by order to 10 shares per investor. The small investor is being offered terms of $5 down and $5 per month per share.

OAKLAND PLANT ON FULL PRODUCTION

H. S. Shuey, secretary of the Merco Nordstrom Valve Company, announces that the new Oakland plant of that manufacturing firm is now in full operation. Mr. Shuey returned to the Coast in December from a business trip to New York City and Washington.

RIO GRANDE SYSTEM IS NOW COMPLETE

Completion of the distributing system in the Rio Grande Valley of South Texas by the Rio Grande Valley Gas Company about the middle of December has made natural gas available for McAllen, Pharr, Mission, Mercedes, Brownsville and San Benito. This supply, which is expected later to spread to the many other growing towns in the valley, is piped from the Mirando fields by the Southern Gas Company of San Antonio, and sold to the Rio Grande Valley Gas Company for retail distribution.

MAMMOTH ENGINES

Two of the largest gas engines ever installed by the Southwestern Light & Power Company are going into that Oklahoma utility's own hydro plant at Chickasha. Two flywheels on the units weigh 55 tons each; bolts securing the engines to their concrete blocks weigh 1,000 pounds apiece, and the washers 250 pounds each.

JAMES DICKEY DEAD

James M. Dickey, gas engineer at the Potrero, San Francisco plant of the Pacific Gas and Electric Company, and a member of the Pacific Coast Gas Association, died Thursday morning, December 29, 1927, in San Francisco. Mr. Dickey came to San Francisco from Minneapolis and entered the service of the P. G. and E. in 1913, as assistant superintendent of the Potrero plant. In 1917 he was transferred for a short time to San Jose, but returned in 1920, taking up the duties of gas engineer. He is survived by his widow and three sons.

PEAT ON HAWAII TRIP

A. E. Peat, treasurer of the Southern California Gas Company, sailed with his wife and son from San Francisco on December 9 for Hawaii, to spend a week of sightseeing and vacation, and return to Los Angeles headquarters of the company by the first of the new year.

VAN BUREN OFFICE OPENS

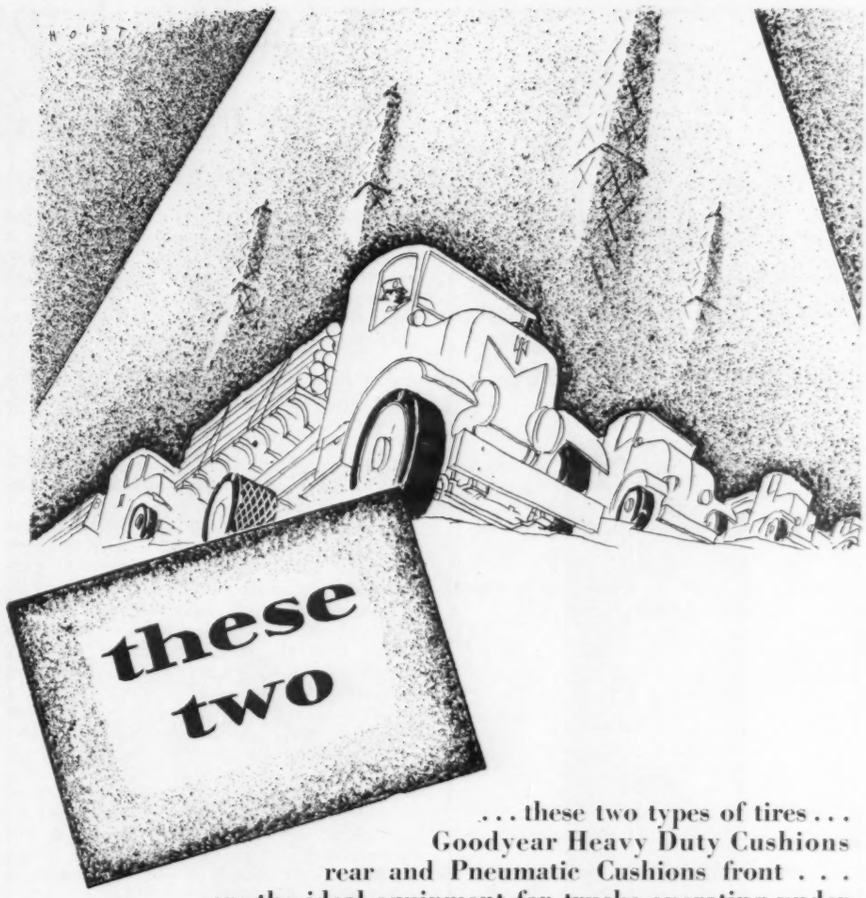
Fort Smith Light and Traction Company, which carries gas service to a number of Arkansas communities, opened its new Van Buren, Ark., office on Saturday, December 10. W. R. Kennedy is local manager at Van Buren.

MANY INDUSTRIALS ON LINES

Industrial consumers of the Portland Gas & Coke Company, which serves oil gas in Portland, Ore., number 3,238 by a recent count. Hotels and restaurants rank as the most numerous class of industrial users, comprising 46 per cent of the total.

RATE HEARING SET

January 4 was fixed by the Railroad Commission of California as the date for a consolidated investigation on rates, of the Los Angeles Gas and Electric Corporation, Southern California Gas Company and Southern Counties Gas Company. Hearings will be at Los Angeles.



. . . these two types of tires . . .
Goodyear Heavy Duty Cushions
rear and Pneumatic Cushions front . . .
are the ideal equipment for trucks operating under heavy hauling conditions. This combination . . . backed by our prompt and practical service . . . will help keep your operating costs at a minimum.

. . . passenger car tires, too! . . .

"A Tire for Every Need"

Truck Tire Service Co.

LONG BEACH
220 East Anaheim Street
622-79

HOLLYWOOD
6523 Santa Monica Blvd.
HOllywood 5521

LOS ANGELES
1244 East Eighth Street
TRinity 6565

ABANDON GASOLINE PLANT

The Diamond Refining Company's gasoline plant near Delaware, Oklahoma, built in 1912 and one of the oldest in the Nowata field, has been abandoned and will be dismantled. Prior to introduction of air-gas lift in the Nowata field this was one of the most commercially profitable plants there, but owing to the fact that the use of air has a tendency to strip the gasoline out of the gas and make the recovery so small, the plant was no longer profitable.

TO OCCUPY NEW BUILDING

Early in February the Oklahoma Gas & Electric Company, Oklahoma City, Okla., will move into its new general office building.

REYNOLDS GAS REGULATOR CO. SALES EXPANSION

The Reynolds Gas Regulator Company, manufacturer of gas governors and controls, announces an expansion of their sales program in their establishing of direct factory representatives in the eastern states of New York, Delaware, Maryland, Virginia, Pennsylvania and District of Columbia, and Michigan. Services of the factory experimental and construction departments are available through these two new sales offices.

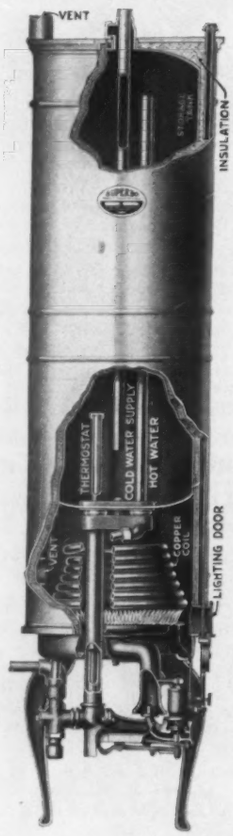
F. E. Newberry, Avon, N. J., is in charge of the New York territory, and Thos. C. Corin in charge of the Detroit office..

The Eastern Service Company, 250 Stuart Street, Boston, Massachusetts, will continue to represent the Reynolds Gas Regulator Company in this territory.

SUPERBO
AUTOMATIC
STORAGE
WATER HEATERS

Manufactured in Los Angeles Since 1914

Superbo "Safety"



A Quality Product

FEATURING: — Dual Safety Control—Detachable Heating Unit—Safety Gas Shut-off.

No. 1—22 gallons	$ 97.50
No. 2—30 gallons	125.00
No. 3—40 gallons	150.00
No. 4—66 gallons	250.00

Prices F. O. B. Factory

Manufactured by

Superbo Mfg. Co.

Los Angeles California

What Will 1928 Bring *to the* Western Gas Industry?

(Continued from Page 19)

by existing consumers. We believe that the future growth of our business depends to a great extent upon the placing of convenient, attractive and efficient appliances in the homes of our consumers. To this end we plan a very active campaign for the introduction of approved appliances during 1928.

Franklin S. Wade,
Vice-President and Manager, Southern Counties Gas Company, Los Angeles, Calif.

"CITIES SERVICE" OUTLOOK BRIGHT

THE gas industry in this territory is facing a period of expansion. The immense gas reserves in the Panhandle of Texas will be available through the lines of the Cities Service Gas Company for both domestic, househeating and industrial purposes shortly after January 1, 1928. With this immense supply available it is only a question of developing the market. This means that all industries in the territory served by the Cities Service Gas Company will enjoy an unusual natural gas service which has not been heretofore available for them, and it means a progressive and intensive program for developing the use of gas for househeating and commercial purposes. We expect a very definite increase in the number of customers now being served by this company with gas for househeating. This will, of course, react to the general benefit of the community as a whole.

T. J. Strickler,
Vice President and General Manager, Kansas City Gas Company, Kansas City, Missouri.

SALES YEAR AHEAD ON COAST

THE past year has shown more sales department activity than has characterized the gas industry in many years, if ever in the history of our business, and I am confident, from plans now under way, that 1928 will be the most outstanding and successful year we have ever known.

There has been a notable change in viewpoint all over the Pacific Coast in regard to sales policy, and where in years past the sale of appliances has been looked upon as a necessary evil, it is now considered sound, constructive good will building.

I am sure the executives of our industry will continue to study our problems from a broad viewpoint and in terms of years, not in months, to the end that we actively occupy the field which is rightfully ours. We own the heating business, if we take it. A strong offensive is the best defense, and I am satisfied that the future holds more of promise than any other period in our history.

C. B. Babcock,
President, C. B. Babcock Company, San Francisco, Calif.

"GOOD GAS YEAR" IN MIDDLE WEST

NINETEEN hundred twenty-eight should be a good gas year in the middle west. Generally speaking, this territory has produced excellent crops this year, which, with the higher prevailing prices, have greatly increased the farmers' buying power. New industries are locating in the middle west and established factories are growing, thus increasing the urban population and payrolls.

These two factors, the improved financial condition of the farmer and the growth of industry, if supported by an intelligent, aggressive selling policy, should produce an increased volume of sales of gas for all purposes—industrial, house-heating and domestic. Nineteen hundred twenty-eight should be a good gas year.

H. R. Sterrett,
President, Des Moines Gas Company, Des Moines, Iowa.

SAN DIEGO LOAD GROWTH SEEN

IN THIS territory in the year 1928 we not only except a load growth incident to our rapid increase in population, but likewise a large gain in house heating and industrial load. Residence heating, especially, is making rapid advances as the public is becoming informed of the superiority of gas over all competitive fuels. The convenience, cleanliness, accuracy of control and moderate cost appeal strongly to the householder, resulting in an ever-widening circle of satisfied customers.

L. M. Klauber,
General Superintendent, San Diego Consolidated Gas & Electric Company, San Diego, Calif.

STEADY INCREASE ON UTAH LINES

CONCERNING the business outlook in our territory for 1928, the year to come, in my judgment, will continue to witness a steady increase in the use of gas, both for domestic and industrial purposes. Gas is rapidly proving its value in this territory as a fuel, both from an economical and efficient standpoint. Househeating is rapidly becoming popular in this territory and I expect a steady increase from that direction. Nineten hundred twenty-seven proved a banner year in the merchandise department, with every indication that 1928 will show even greater strides. Extra plant capacity is planned for next year, as we expect 1928 to show a decided increase in gas sales.

E. A. Angley,
Vice-President, Utah Gas & Coke Company, Salt Lake City, Utah.

LIQUID PURIFICATION OKAY

The new liquid purification system that has recently been installed in the Sacramento and San Rafael plants of the Pacific Gas and Electric Company is working in an entirely satisfactory manner, according to reports submitted to Harry Smith of the company's gas construction department. A similar system is under construction in the Oakland plant.

PAY FOR 71-DAY DELAY

The Houston Gulf Gas Company has recently agreed to pay $150,000 plus interest for a 71 days' delay in supplying the city of Houston by March 1, 1926, in accord with a stipulation made in the franchise. The company's line from Southwest Texas supplies the Houston Gas & Fuel Company, retail distributor in Houston.

CHAMBER HAS XMAS JINKS

More than 500 members of the Chamber of Mines and Oil, Los Angeles, gathered at the Ambassador Hotel in that city, for the Chamber's annual Christmas Jinks. The program ranged all the way from Christmas carols to the closing treat—a production of "So's Your Oil Man", the playlet which made such an impression at the A. P. I. Chicago sessions, earlier in the month.

HOUSTON GULF GAS COMPANY STOCKHOLDERS ELECT BOARD

Stockholders of the Houston Gulf Gas Company of Houston met late in December and elected the following directors: O. R. Seagraves, W. L. Moody, III, E. L. Phillips, Frank J. Stolts, George Olmstead, E. G. Connette, J. A. Elkins, I. E. Van Doorn, B. E. Heppler, C. B. Ewart, and Henry R. Frost.

Directors of the company recently elected will meet in New York to elect a president to succeed W. L. Moody, Jr., of Galveston, Texas. Houston Gulf Gas Company now supplies the Houston Gas & Fuel Company, which in turn furnishes the city with natural gas for domestic consumption and also wholesales gas to several industrial concerns operating on the Houston ship canal.

KULP OFF FOR EAST

Stanley Kulp of the San Francisco office of the Ingersoll Rand Company leaves in the early part of January for an extended trip to the home offices and plant of his company in New York. Mr. Kulp anticipates spending about three months in the East.

PIPE FIRM IN MONROE

The Monroe Pipe & Supply Company has opened a supply house in Monroe, Louisiana, with a $150,000 stock, and will handle products of the Central Tube Company. This company will have headquarters at Tenth and Washington Streets, and will be managed by H. Dennis. It is a subsidiary of S. Bender Iron & Supply Company of Shreveport.

FRANCHISES AWARDED

A. J. Hardendorff has been awarded a natural gas franchise at Guymon, Texas County, Oklahoma. A well completed by the H. F. Wilcox Oil & Gas Company, nine miles northwest of Guymon will supply the fuel. Hardendorff also has the gas franchise at Clarendon, Donley County, Texas.

LOUISIANA PUBLICATIONS ON GAS CONSERVATION

Two recent publications of the Minerals Division, Department of Conservation of the State of Louisiana, are of interest to gas men. "Closed Pressure and Open Flow Capacity Tests for Wells of Monroe and Richland Gas Fields" is the title of one pamphlet, and Bulletin No. 12, on the Monroe gas field, is the other. William F. Chisholm is director of the Minerals Division.

FORT SCOTT LINE

Gas is being brought to Fort Scott, Kansas, through a $50,000 line from fields eight miles distant, in Bourbon county, Southwest Gas Company, with headquarters in Independence, Kansas, is behind the pipe line project.

CHARTER McPHERESON COMPANY

The McPhereson Gas Company of Wichita, Kansas, a subsidiary of the Rice County Natural Gas Company, will serve the town of McPhereson with natural gas under a recently secured state charter.

And Now the *Payne* FLOOR FURNACE has A. G. A. Approval

BLUE STAR approval has been brought to the Payne Furnace Company a second time. Now the Payne all-welded, gas tight Floor Furnace wears the emblem of approval.

This pipeless furnace is especially designed for cottages and bungalows. It requires no basement. . . .is suitable for heating one room or groups of rooms opening into each other. The A. G. A. Testing Laboratory Approval is based on efficiency, reliability and performance.

More than thirty thousand Payne Furnace installations during 14 years of Payne service.

The illustration shows a cross section of a typical Payne all-welded gas-tight Floor Furnace with a pilot light control for automatically lighting the gas the instant it is turned on.

PAYNE FURNACE & SUPPLY CO. INC.

Main Office, 338 Foothill Road, Beverly Hills, Calif.
Branch: 3810 Broadway, Oakland, Calif.
Branch: 115 E. Union St., Pasadena, Calif.
Branch: 478 Sutter St., San Francisco, Calif.

Chas. C. Moore & Co. Engineers, Inc.

CONTRACTORS FOR COMPLETE PLANTS

High Grade Machinery

The Babcock & Wilcox water tube boilers
Corliss high speed and poppet valve engines
Babcock & Wilcox superheaters
Hamilton compressors
Green fuel economizers
Wheeler Condenser & Engineering Co. condensing machinery
Cochrane feed water heaters (open and closed)
Cochrane feed water metering heaters
Cochrane feed water softeners (hot and cold processes)
Cochrane steam and oil separators
Cochrane flow meters
Moore automatic fuel oil regulators
Diamond soot blowers
Lagonda tube cleaners
Copes feed water regulators
Lagonda automatic boiler stop valves
Leslie reducing valves

And All Power Plant Auxiliaries

Address our nearest office for catalogs and complete information

Home Office: SAN FRANCISCO, Sheldon Bldg.

New York City, Hudson Terminal Bldg.
Los Angeles, Central Bldg. Portland, Gasco Bldg. Seattle, L. C. Smith Bldg.
Salt Lake City, Kearns Bldg. Honolulu, T. H. Phoenix, Heard Bldg.
Vancouver, B. C., Standard Bank Bldg.

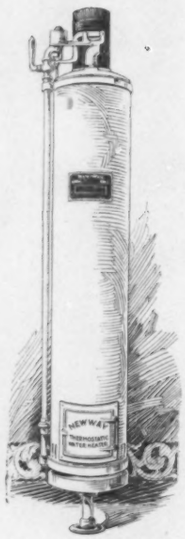
IT IS DIFFERENT
IT STARTS HOT

—

The Economy Way is the

New Way

THERMOSTATICALLY



CONTROLLED

—

In the New Way the pilot light heats the water in the coils,—always—there is no re-heating of the coils and heater every time the hot water faucet opens.

The New Way saves gas, water and time.

—

Made and Guaranteed by

New Way Manufacturing Company, Inc.

894 FOLSOM STREET
SAN FRANCISCO

Artist's conception of New Orleans' Public Service headquarters

$2,000,000 Utility Headquarters *in* New Orleans

Upwards of 30,000 people visited the new $2,000,000 eight-story home of the New Orleans Public Service, Inc., shown above, on the day of its formal opening and reception to the public, held last November. With the completion of this splendid structure the company for the first time since its organization has all departments under the same roof.

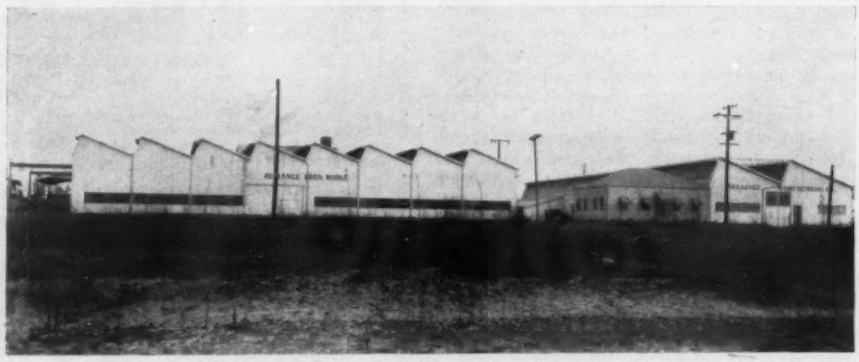
Reliance Mfg. Co. *and* Pacific Meter Are Hosts

W. M. Thompson of the Reliance Manufacturing Company, and W. D. Dickey of the Pacific Meter Company were joint hosts to executives and district managers of the Southern Counties Gas Company, Los Angeles, Calif., on Sunday, December 11. An inspection of the Reliance Manufacturing Company's new plant at Alhambra was first on the program, following which the guests were provided an excellent lunch at the Annandale Golf Club, Pasadena. Eighteen holes of enjoyable golf in the afternoon wound up the occasion.

Many features of the Reliance plant were of interest to the gas men. The saw-tooth roof construction, shown in the exterior view above, came in for particularly favorable attention. Through this means the plant interior achieves daylight illumination which is close to perfection.

Some of the mechanical equipment used in the production of Reliance Regulators, and inspected by the Southern Counties men, included the large surface grinder and the eight-spindle machine, which drills and taps flanges in one set-up.

The foundry and loading yards at the Reliance plant are covered with a three-ton electric crane, and in this and other respects the factory facilities are thoroughly "up to the minute."



Reliance Manufacturing Company's new plant at Alhambra, Calif.

The *Venting* Problem

(Continued from Page 25)

ference between two kinds of materials. For example, we find that a 2x6¼ inch rectangular cement flue will have a capacity of 74 pounds, and the 2x6¼ inch rectangular terra cotta flue a capacity of 90 pounds, but the total available draft is greater with the terra cotta and if the capacity were increased with the latter so that the available draft were the same, the difference would be even greater. Such calculations can be made readily and the comparison made on any basis desired.

In a 40-foot flue there is a slightly greater loss in heat in the first twenty feet than in the second twenty feet, but for all practical purposes the capacities may be considered the same for heights lower than forty feet. The available draft for the lower heights is proportional to the height.

Where the appliance is connected to a flue with a considerable length of almost horizontal vent connection a definite pull is required to force the products through this vent connection. In this case the capacity of the flue is determined by the residual draft available after deducting this pressure loss. Since the "stack effect" increases approximately in the same ratio as the increase in height of stack, the higher the stack the less its capacity is influenced by this initial loss in pressure.

Flue capacities are ordinarily based on capacity with air and the difference in density of air and flue gases is ordinarily not considered. This factor was not considered in the data shown in Table 1, but can easily be calculated for any dilution factor.

The following and final article in this series by Walter M. Berry will discuss some remedies for bad venting conditions.—Editor.

FOREIGN FURNACE SHIPMENTS

American manufacturers of gas appliances are beginning to take their turn at exporting their efficient products. For example, in December the Payne Furnace & Supply Co. Inc., Beverly Hills, Calif., listed an order for shipment of gas furnaces to New Zealand, and another to be consigned to Buenos Aires.

CHANGES IN HOUSTON COMPANY

Frank J. Stolz has been made president of the Houston Gas Securities Company, which recently took over control of the Houston Gas & Fuel Company of Houston, Texas. He succeeds James A. Baker, who will continue with the Houston Gas & Fuel Company. Under the new organization E. G. Connette is vice president and J. A. McKenna, secretary and treasurer of the Houston Gas & Fuel.

NEW RATES NEEDED

The Long Beach, Calif., city council in December voted to adopt a recommendation for an increase in gas rates of the municipal gas department. Gas has been served at 50 cents per thousand cubic feet, bringing the department monthly income to only $108,000 in the face of $203,000 monthly expense. The adopted report would institute a $1 service charge, the 50 cent rate per thousand, and a 10-cent surcharge.

KINGSVILLE TO HAVE GAS

Houston Oil Company is to take gas from its White Point, Texas, field to Kingsville, Kleberg County, to supply that city, and a small line is now under construction for that purpose. Gas from the Kingsville field is considered inadequate for supplying the town's needs.

Billions of Bubbles

How's This for Performance

Can your gasoline absorption plant equal this for performance? Typical records from two Campbell Plants are as follows:

	Plant A.	Plant B.
Daily production, gallons..	22,000	3,180
Oil rate, gals. min.....	385	79
Temperatures degrees		
Fahrenheit—		
Lean Oil to Absorbers.....	69	65
Sat. Oil from Absorbers...	80	81
Heat Exchange—		
Sat. Oil Inlet.....	80	81
Sat. Oil Outlet.....	266	264
Lean Oil Inlet.....	316	321
Lean Oil Outlet.....	124	113
Preheater—		
Sat. Oil Inlet.....	266	264
Sat. Oil Outlet.....	326	326
Steam Pressure, lbs. sq. in.	130	135

Efficient heat exchange, as accomplished by Campbell Equipment means:

1. Decrease in Boiler Plant Initial Investment.
2. Decrease in Oil Cooling Coil Investment.
3. Decrease in Operating Expense.
4. Increase in Gasoline Production.

CAMEL-DRY GAS

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Campbell Oil-Froth Absorbers

MODEL 10 SERIES
With or Without Mercury Seal

Spring Type
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Products for all kinds of Pressure Reduction—for either artificial or natural gas.

GOVERNORS — Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.

REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.

REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana

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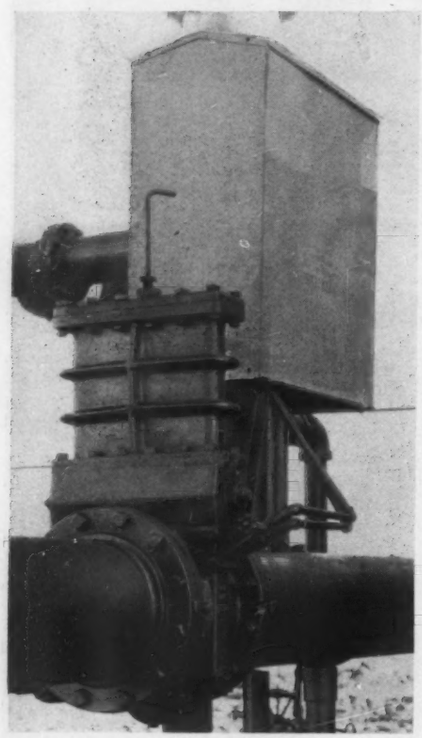

Consistent!
Accurate!

A WORLD famous institute of technology in Massachusetts has this to say of the ROBINSON Orifice Fitting—"it can be used very satisfactorily with either manometer or recording meters to give consistent and accurate results." Write for details regarding ROBINSON success in the gas industry. Over 8000 in use.

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ROBINSON ORIFICE FITTING

NATURAL GAS GASOLINE OPERATIONS

Compiled by E. T. Knudsen

Department of Commerce, Bureau of Mines, Division of Mineral Resources and Statistics

ONE hundred and thirty-two natural-gas gasoline plants with a daily indicated capacity of 1,380,950 thousand cubic feet, report a recovery of 41,713,674 gallons of natural-gas gasoline from 26,790,203 thousand cubic feet of gas treated in November. This is a decrease of 274 barrels in daily average production.

Utilization of natural-gas gasoline amounted to 1,107,346 barrels, an increase over October of 72,054 barrels. Daily average utilization of 36,912 barrels was 3,806 barrels more than daily average production of 33,106 barrels.

Stocks of natural-gas gasoline at the end of November amounted to 668,322 barrels, of which 29,731 barrels were reported by natural-gas gasoline plant operators and 638,591 barrels by refinery operators. This is a decrease of 114,163 barrels under October stocks. This stock figure of 668,322 barrels is approximately eighteen days' supply at the current rate of consumption.

Production of gasoline during the month of November amounted to 5,169,492 barrels, a daily average of 172,316 barrels. This is a decrease in total production of 186,355 barrels or 3.48 per cent under October output and an increase of 850,473 barrels or 19.69 per cent over the output of November, 1926.

Of the total gasoline produced 32,330 barrels were reported as finished gasoline produced by natural-gas gasoline plant operators. Production of gasoline from cracking processes increased in November to 499,460 barrels.

Stocks of gasoline show an increase of 56,528 barrels during November and at the end of the month amounted to 11,364,829 barrels. This stock figure includes 226 barrels of finished gasoline reported by natural-gas gasoline plant operators.

CALIFORNIA NATURAL GAS GASOLINE PRODUCTION, DISTRIBUTION AND STOCKS
NOVEMBER, 1927

PRODUCTION

Type of Plant	*Gas Treated M.C.F.*	*Natural-Gas Gasoline Produced (Gallons)*	*Gasoline Recovery per M.C.F. Gas Treated*
Oil Absorption	17,388,694	27,274,011	1.568
Compressor	247,189	349,051	1.412
Combination Comp. and Oil Absorption	9,154,320	14,076,654	1.538
Drip	.....	13,958	.....
Totals	26,790,203	41,713,674	1.557

Finished Gasoline produced at plants—32,330 Bbls.

DISTRIBUTION

Stocks First of Month	.....	782,485 Bbl.
Production during Month	.....	993,183 "
Quantity mixed with crude or unfinished oils	204,523 Bbl.	.....
Used in Blending at Refineries	894,470 "	.....
Stocks end of Month	668,322 "	.....
Used at Plants, Shortage and Evaporation Losses	8,353 "	.....
Totals	1,775,668 "	1,775,668 "

STOCKS

Natural-gas Gasoline held by Natural-gas Gasoline Plant Operators	1,248,687 Gal. or	29,731 Bbl.
Natural-gas Gasoline held by Refiners	26,820,822 " "	638,591 "
Totals	28,069,509 " "	668,322 "

Finished Gasoline (Motor Fuel) held by Natural-gas Gasoline Plant Operators—226 Barrels.

Actual Service Begins *through* Texas-Kansas Line

ON December 30 natural gas from the Texas Panhandle came into the main trunk line system of the Cities Service Gas Company through its new twenty-inch pipe line from Pampa, Texas, to Wichita, Kansas, hooking up at the latter point with the balance of the organization's transporting lines.

Including gathering lines, the new system, which cost upwards of $15,000,000, is 267 miles in length, approximately 250 miles of it being the 20-inch construction. Only eight months were required to complete this major project.

Completion of the line means a greater supply of gas for the 135 cities, towns and communities in Oklahoma, Kansas and Missouri that are served by the Cities Service Gas Company, a subsidiary of the Empire Gas and Fuel Company.

The initial carrying capacity of the line is approximately 70,000,000 cubic feet per day.

Located along the route of the pipe line are three compressor stations, at Pampa, Texas; Mooreland, Okla.; and just south of Wichita, Kansas. The Pampa station is the southern terminus, the Mooreland station is the intermediate boosting station, and the Wichita station sends the Texas gas into the balance of the Cities Service Gas Company's trunk line system.

CARBON BLACK UNITS WORKING

The Kosmos Carbon Company was scheduled to have seven units of its Borger, Texas, carbon black plant smoking by the opening of 1928. This number of units will consume 20,000,000 cubic feet of residue gas daily, and will turn out approximately 1½ cars of the product, valued at 6½ cents per pound. Twenty dwellings for housing laborers have been erected, and the Santa Fe has laid 300 feet of trackage in the yards.

NEW METER READING RECORD?

Meter readers of the San Diego Consolidated Gas and Electric Company think they have established a new record for accurate reading. On November 3, 1927, Paul Field read 1080 meters during an eight-hour day, or one meter every 27 seconds. Reading 996 meters the same day, Clyde Randall was not far behind Field. Randall averaged a meter every 29 seconds. Both records were made in an average residential territory.

TO BEGIN GALVESTON LINE BY JANUARY 1

Paul E. Nichols, manager of the Galveston, Texas, Gas Company, has announced plans to lay the extension line from Texas City to Galveston, which will bring natural gas from the Houston Pipe Line Company's line from Southwest Texas to Galveston through the company's 16-18-inch main line via Houston. Order has been placed for the pipe, and work on the extension is booked for January 1 at the latest.

"MOVING SALE" STAGED BY PORTLAND COMPANY

In connection with the Portland Gas & Coke Company's change of office headquarters to the new Public Service Building, which was formally opened to the public on January 3, a "moving sale" at the old location, the Gasco Building, at Fifth and Alder Streets, was offered to the public. Ten per cent reduction on all appliances was the inducement to buy. Company advertising for the sale made good use of views of the splendid new structure which now houses the Portland Gas & Coke and its affiliated companies, the Pacific Power & Light Company and the Northwestern Electric Company. The actual opening of the new building for the transaction of business came on December 19.

LARAMIE PLANT SITE PICKED

R. Y. Lisco, Jr. of Scottsbluff, Neb., who secured a gas franchise in Laramie, Wyo. on December 6, has selected a plant site and expects to be able to furnish gas by the middle of August of this year.

EL CENTRO ADDITIONS

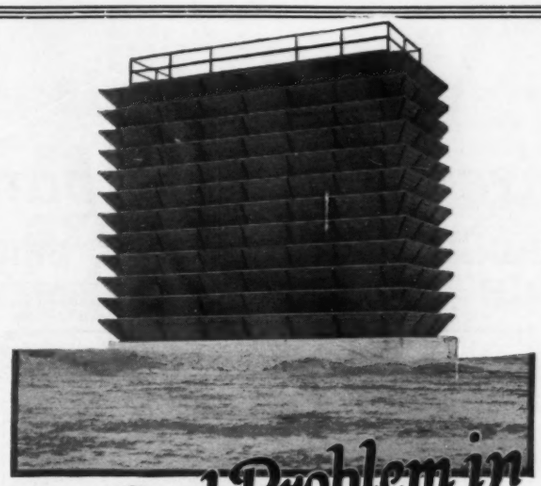
Additional gas plant facilities to be installed at El Centro, Calif., by the Inland Empire Gas Company, call for an expenditure of $40,000, according to H. W. Burkhart, president of the company. Brawley, Calexico, Mexicali and other Imperial Valley towns are covered in the company's franchise. Last year service began in El Centro, and extensions are planned to other communities as soon as possible.

WATKINS AT PUEBLO

Lloyd J. Watkins, formerly with the Watertown Gas Company of New York, and for the past three years assistant superintendent of the Public Service Company of Colorado at Ft. Collins, has been made distribution superintendent for the Pueblo Gas and Fuel Company, Pueblo, Colo.

LARGE GAS PRODUCTION BACK OF EMPIRE LINE

Fourteen large gassers were early in December awaiting completion of the Empire's $20,000,000 Pampa, Texas-Wichita, Kansas, line. The wells have a potential capacity daily of 420,000,000 cubic feet of production, while the ultimate capacity of the line will be 97,000,000 feet daily. Twelve of the 14 producers are located on the 65,000-acre Burk Burnett ranch, and have a combined daily flow of 367,000,000 feet.



The Real Problem in Cooling Tower Design has been SOLVED!

In cooling tower construction the one difficult problem has been to design a tower THAT COOLS THE WATER AND AT THE SAME TIME KEEPS IT IN THE COOLING SYSTEM IN SPITE OF WINDS.

This would be relatively simple if the wind always came from the same direction and at the same velocity.

In the Fluor Cooling Tower, and no other, the patented drift eliminators can be adjusted by one man in five seconds to accommodate any change either in wind direction or wind velocity, thereby assuring efficient performance under all conditions.

Write for Bulletin 2-A or telephone our nearest office for particulars.

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FLUOR REDWOOD COOLING TOWERS

The Strickler Ratchet Pipe Cutter

The STRICKLER Ratchet Pipe Cutter automatically cuts cast iron, steel and wrought iron pipe (from 1½ to 30" in diameter) by hand (either in the trench or in the shop).

You can cut any pipe from any position easily. Simply pump the handle and the STRICKLER does the rest. Order your STRICKLER Now

W. W. STRICKLER & BROS.

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FIRE BRICK, INSULATING BRICK
HIGH TEMPERATURE CEMENT

High Grade Refractories
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Gas Timers
Gauges
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Gas Tape
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Connelly Iron Sponge & Governor Co.
NEW YORK CHICAGO

Sales Conference Planned *for* Headline Attraction

(Continued from Page 29)

The purpose of this letter is to ask that you and your sales organization do your share toward making this a thoroughly informative conference. You have met with real success in selling gas through some plan, campaign, or method and we want you to write as many short, pithy papers as you have successes to your credit and tell us how you did it. In return you can hear what others have done and of course the informal discussions which follow each presentation will be the best part of it.

We already see visions of this meeting breaking an altitude record for high-lights in sales methods and load building. The American Gas Association will send two men to our meeting; one undoubtedly will be Mr. J. J. Burns, Chairman of the A. G. A. Commercial Section and Commercial Manager for the Laclede Gas Light Company, St. Louis, Missouri. Mr. J. E. Davies, General Manager of the Peoples Gas, Light and Coke Company stores, will also be in attendance. Mr. Davies, in accepting the invitation to attend our Sales Conference, wrote at length regarding the value of such meetings and in part said:

"It is my firm belief that our Sales Conference in Chicago proved of greater interest and value than any similar group of meetings I have ever attended."

In order that this conference live up to its possibilities, we want to organize it right and, therefore, ask that you furnish us at once with an idea as to what part your organization can take in it. In general what do you wish to discuss and about how long will you require to present it? Actual titles and authors can follow later, but give us this general idea *now*.

Yours for a progressive Gas Industry,

C. R. MILLER,
Chairman, Commercial Section.

COKE OVEN GAS FOR LACLEDE

The Semet-Solvay Engineering Corporation of New York has been awarded a contract by the Management and Engineering Corporation of Chicago for the construction of a purifier to be built on the plant of the St. Louis Coke and Iron Company at Granite City, Ill. Coke oven gas will be purified and piped to the mains of the Laclede Gas Light Company, St. Louis. Construction work will proceed at once.

BIG SPRINGS TO BE GAS TOWN

Consumers Gas Company plans to lay an eight-inch line from the Howard County, West Texas, gas field to Big Springs, 16 miles, at a cost of approximately $300,000. This arrangement follows the securing of the Big Springs franchise by the company early in December. The contract states that domestic gas will be piped into Big Springs by March 15.

30,000 SHARES SOLD IN TEN DAY DRIVE

Closing one of the most successful employee customer ownership campaigns in their history, the Empire Companies announce that more than 30,000 shares were sold in the recent ten-day sales period. Five thousand employees in the territory from Toronto on the north to the Mexican gulf on the south and embracing the middle western states were engaged in the sale. This was the eighth customer ownership campaign held by the Empire Companies.

How One Gas Company Uses Its Own Fuel

(Continued from Page 21)

than can be realized on resale. In the case of water heaters, the paint has burned off in places and the metal has rusted. While a wire brush, plenty of elbow grease and a little paint will remedy this trouble, the question of reconditioning cost enters again. With nearly all appliances it is necessary to do more or less cleaning and with the old method of handwork many appliances are junked that from all other points could be profitably reconditioned.

When it was decided to try cleaning by some less expensive system, our customers' methods were studied and it was finally decided that the most economical way to do the work was to boil in an alkali solution the appliances to be reconditioned. Immersion type heaters were chosen for this work and after three years' service are performing very satisfactorily.

HEATERS DESCRIBED

Figure 1 shows a unit of two immersion heaters used in reconditioning ranges and water heaters. The alkali solution is in the left-hand tank, while the right-hand one is used for rinsing. The heaters are built into the tank and consist of two horizontal passes of five-inch iron pipe spaced about two inches above the bottom of the tanks. The inlet end of the pipe is welded into the tank in such a way that about four inches project outside. A five-inch cap is screwed on the projecting end. A dozen three-quarter-inch holes drilled in the face of the cap admit sufficient secondary air. The center of the cap is drilled and tapped two-inch standard pipe thread and a standard venturi type atmospheric mixer is attached. The lighter, as can be seen in Figure 1, is of the luminous type, so arranged that the flame is shot into the heater tube through one of the secondary air holes in the cap. After the burner is ignited, the lighter is turned off. In some of the immersion tank heater installations, a two-foot gas hose is used with one-eighth-inch nipple in the flame end, but a rigid connection causes less service trouble.

Operating tests on these heaters and others of similar design show that a heat input of 1660 B.t.u. is required per gallon of solution to raise the temperature 160° F. in one hour. In determining the size of pipe to be used and the number of passes necessary, the practice is to allow one square foot of internal pipe surface for each nineteen gallons to be heated 160° F. in one hour.

In the more recent immersion heaters, the pipe is not welded directly to the tank, but is attached by means of a coupling welded to the tank. The pipe is screwed into the coupling either with a long thread that will project through the coupling far enough to catch the cap or with a normal thread. In the latter case, a short nipple is used from coupling to cap.

One advantage of the immersion tank heater is that the fire hazard is reduced. In some cases where this type of heater is used in a room where gasoline or similar vapors are encountered, a fine mesh gauze screen is built over the secondary air openings and primary air shutter on the mixer. Another advantage of the immersion type heater is a low installation cost. It can be installed in existing tanks or vats easily and cheaply. With only one mixer and no burner ports, the servicing is greatly reduced. One disadvantage is that the rate of temperature

Pipeline Leaks are Profit Leaks

The study of economical pipe-line maintenance . . . the search for a means of eliminating leaks, corrosion, erosion and the other costly troubles . . . is surely and steadily pointing to PIONEER PIPE COVERING.

The protection and added service given to buried or exposed pipe-lines by PIONEER PIPE COVERING has been proved by test and by use.

Try it out on your pipe-line problems . . . you'll get lower maintenance costs and greater profits on the money invested in such equipment.

For a permanent protective metal coating to defy alkaline erosion, oxidation and electrolysis be sure you specify PIONEER RUBBERTEX

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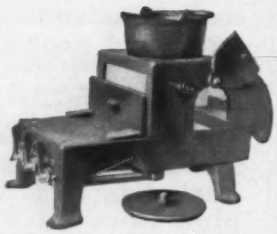
JOHNSON Combination Bench Furnace



No. 118 Furnace

This furnace is one of the most popular items in our entire line. It won its popularity through the fact that it serves a number of practical purposes with equal efficiency. It will heat the largest soldering coppers, branding irons, or stenciling irons. Also used for tempering, heat-treating, annealing, case-hardening. The melting pot has a 25-pound capacity and is designed for melting soft metal such as lead, babbitt, tin, zinc, etc. All this is accomplished without the use of forced air blast or blower. Write for full details.

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MAAS Oxide

Removes the Maximum Hydrogen Sulphide from Gas

A highly potent Commercial Compound developed after careful research and exhaustive tests in the Maas Laboratories and used extensively by Gas Companies for removing Hydrogen Sulphide from gas at low cost with high efficiency.

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SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

rise is not as rapid as with the customary direct flame impingement burner equipment, due to a lower maximum gas rate. Another is that the pipe in the bottom of the tank makes it difficult to handle small pieces if boiled loose. This objection can be eliminated by building into the tank a heavy wire screen an inch or two above the pipes or by handling small parts in a wire basket.

GAS IN METER REPAIR

Another place where gas is used is in the gas meter department. Here gas-fired soldering pots are to be expected, as is the use of gas for testing meters and regulators. Gas is also used for heating the boiling tanks, where meter cases are boiled to remove the old paint and where regulators are boiled to remove gummy deposits. In these tanks, the immersion type heater was not used chiefly because with the pipes in the tanks it would be hard to handle small parts and to flush down the sediment.

Figure 2 is a view of one corner of the gas meter shop boiling room, showing the two regulator boiling tanks in the foreground, the two five-light tin case meter boiling tanks, and, in the far corner, a tank for boiling large tin meters. Each tank is heated by three atmospheric burners, each burner having its own mixer and control valve. Burner heads are the usual cast iron tee type, two inches wide and eighteen inches long, with three rows of 1/16 inch ports. The burner capacity is about 80,000 B.t.u. per hour each. Each burner head is placed crosswise of the tank and about three inches below the bottom.

Small size tanks have been used as they give better results than large ones. In boiling meter cases to cut the paint and gummy deposits, a strong alkali solution must be used. If the meters are boiled too long, the alkali tarnishes the tin. By using small tanks and only one layer of meters in each tank, individual meters can be removed when desired without disturbing the others. Where a large tank is used and several layers of meters are boiled at one time, it is impossible to prevent some from tarnishing, particularly those in the bottom layer.

Figure 3 shows one corner of the regulator repair section of the meter department. Low-pressure gas is compressed to about twenty-five pounds pressure and stored in the tank at the right. Through two steps the pressure is cut to two pounds, which is used in testing. The testing equipment is shown at the left. In testing, the regulators are clamped in place and tried to make sure there are no leaks. New regulators are given a soap-suds test, while old ones get a flame test. They are then checked to make sure the valve will hold tight at no flow. If with two pounds inlet pressure, the outlet pressure rises above seven inches with no flow through the regulator, the regulator is rejected and goes back to the repairmen to be reassembled.

TO INCREASE CAPITAL STOCK

Pacific Gas and Electric Company contemplates an increase in capital stock from the present amount of $160,000,000 to $400,000,000, the stock when increased to be classified as follows:

6% First Preferred of the par value of $25 per share, $140,000,000; 5½% First Preferred of the par value of $25 a share, $40,000,000; 5% First Preferred of the par value of $25 per share, $20,000,000; Common stock of the par value of $25 per share, $200,000,000.

Action on this important matter will come at a special meeting of the company's stockholders, called for February 13.

Compressor Plant Design *and* Operation

(Continued from Page 23)

working. We believe that this arouses to some extent a feeling of pride in the appearance of the machinery on the part of the operator that cannot be aroused in any other way. It at least does away with any possibility of successfully "passing the buck" and gets results.

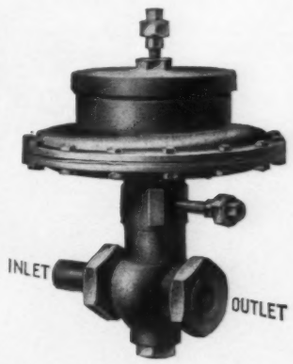
AVOIDING PERIODIC OVERHAULING

If a close watch is kept on plant efficiency and frequent use made of the indicator to determine the internal condition of the machines, the periodic overhauling orgies indulged in by some operators will be found unnecessary. It is a fact that two pieces of equipment erected at the same time by the same crew, manufactured by the one manufacturer and operating under identical conditions will not always give equal service, and if one requires a certain amount of repair work at the end of a stated period it is often assumed that the other should have the same. This is not always the case, and the difference in life of wearing parts may be accounted for by lack of uniformity in materials or lubrication or both. More than likely the latter factor is accountable, for regardless of material if we had perfect lubrication we would have no wear at all. As a result of the periodic overhauling, slightly worn parts are removed because it is time to overhaul and for no other reason, and as often as not new parts substituted that in a very short time have the same degree of wear. In many cases their total life will be less than the additional service that would have been received from the discarded parts. This is not to say that machinery should be run as long as it will turn over, but the operation should be carefully and intelligently watched and the machinery given a chance to wear out in normal service.

THE LUBRICATION PROBLEM

The subject of lubricating oils and lubricating devices is highly controversial, but the writer will risk the following observations: Compressor lubrication for gas service is fairly simple; in fact, for absorption plants where the compressors are handling gas direct from the wells it is doubtful if the lubricating oil applied to the cylinder has any value; if it has, a common red engine oil will do as well as the highest grade of compressor oil in the market. Quantity, however, is important, as is method of application. The oil should be pumped to the cylinder wall and if timed to fall on the piston is more likely to be beneficial than if not timed. It should be fed freely for best results because of the fact that when once exposed to the cutting of the gasoline vapors its lubricating value is materially reduced. For dry gas it may be injected into the incoming gas. Here again the quality is not important and the problem should not be confused with the lubrication of air cylinders where carbon troubles are encountered and there is danger of forming a combustible mixture if low grade oil or an excessive amount is used.

On the power end undue importance is often given flash and fire test of an oil and the extremely important characteristic of viscosity at high temperatures neglected. A test of many so-called heavy oils will reveal that the viscosity at the high temperatures that prevail in the power cylinder is



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An unusually sensitive, frictionless and long-lasting governor to be used either as a direct governor, or for individual service. Maintains a uniform pressure throughout the entire range of flow.

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Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes, From 1 Inch to 24 Inches; For All Service. 1 oz. up to 1,600 lbs. Pressure to Square Inch.

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Sales Engineer
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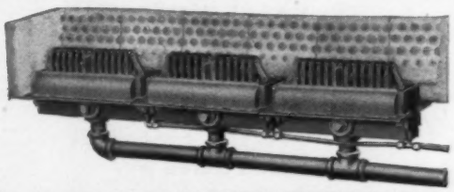
R. M. C. Gas Burner



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KEY *Special* PIPE JOINT COMPOUND

Water-Proof

KEY SPECIAL PIPE JOINT COMPOUND will effectively seal screw thread and gasket joints for such service as Gas, Water, Steam, Compressed Air, etc.

One of the many advantages this compound has over the commonly used red leads and oils, etc., is that the pigment will not settle to the bottom of the container, thereby holding the contents in equal suspension at all times ready for service.

KEY SPECIAL PIPE COMPOUND is not a quick hardening cement but a plastic lubricant and filler that will seal the most obstinate joint with ease.

You may test the high quality of this product by taking a small quantity between the fingers which will immediately demonstrate the wonderful lubricating qualities along with the "pull or drag" that makes possible a permanent seal without resorting to cementing materials, most of which are very undesirable and impracticable to use.

Write for **FREE** Sample

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The Magic Way Company

Gas Heating Devices

including

"Magic Way" Gas Furnaces

"Magic Way" Control Valves and Switches

"Potter" Radiators

"Steel Made" Radiators

"Cole" Floor and Wall Heaters

"Hall" Floor Furnaces

Manufactured by

Magic Way Company

National City San Diego California

very low, which naturally greatly impairs the lubricating qualities. However, a larger amount of the poorer grades will in all probability answer the same purpose as the high grade oil until such time as the residue builds up on the piston and in the ring grooves to such an extent that the piston and rings become a solid non-yielding body. When this condition is reached an increase in load or operating temperature causes the piston to stick and is indicated by a heavy pounding noise in the cylinder. This residue, or rather the nature of the residue, is one of the most important features to keep in mind when choosing an oil. If tests are made on two or more oils of different specifications it must be borne in mind that there are three ways of removing the oil from the cylinder surface—the heat of combustion, the wiping action of the piston and rings, and the force of gravity; also the high flash oil will longer resist the action of the heat, being also probably more viscous will longer resist the wiping action of the piston and the force of gravity; therefore, a smaller amount of oil will be sufficient than of an oil less viscous and lower in flash. We very often find engine operators changing from a high grade oil to a lower grade without increasing the amount used. If the results are satisfactory it indicates that an excess amount of the high grade oil was being used rather than that the lower grade oil is of equal value per gallon. Then if, as the foregoing remarks have attempted to show, either grade may be used providing the quantity is right, the residue should be given consideration both as to quantity and nature, and finally if no advantage is apparent, price may govern the final choice.

The temperature of the jacket water is a debatable question. Higher thermal efficiency is obtained with temperatures above 200° F. and in some cases European manufacturers circulate the water under pressure for test runs in order to maintain temperatures in excess of 212° F. This, however, is too high for every day operation for various reasons. Among them are lubricating difficulties, imperfect circulation causing steam pockets and overheating in various parts of the cylinder and head castings, undue casting strains and flash evaporation causing scale formation unless pure water is used. The small gain in thermal efficiency will be more than offset by increased repair costs and loss in engine hours if jacket temperatures in excess of 150° are maintained. Any marked change in temperatures should be investigated, for a temperature lower than normal may mean that the heat is not being carried away, while a higher temperature may indicate a decreased water supply or an engine or compressor in need of repairs. The compressor requires frequent careful inspection if high efficiency is maintained, for while large valve leaks may easily be detected either by the ear or by higher temperatures than normal, small ring leaks and head gasket leaks will go unnoticed by the average operator. For best operation two points may be stressed above others; they are rigid adherence to a routine periodic inspection at frequent intervals and a fairly complete log which should include a record of repairs, temperatures, pressures, fuel consumption and output. The first will uncover the major troubles as they arise, while the latter points out to the operator what has been done and the result, and obviously that or better can be done again.

Can't Afford to Neglect *the* Domestic Field

(Continued from Page 31)

are these forces and in what way do they tend to bring about this unsatisfactory condition?

Grocery Store: Seventy-five per cent of the foods sold in our local grocery stores are canned foods. Every time one of our consumers buys a can of ready-cooked food, we lose cooking revenue. During the last five or six years there has been a rapid growth in the canning business. You can buy foods in cans today that never would have been thought of five years ago. Figures which we have at hand indicate that for every dollar spent in advertising uncooked foods there were $2.50 spent in advertising ready cooked or canned foods.

Apartment Houses: Look over your city and see the number of new apartment houses which have been constructed in the past few years. Many families formerly occupying detached homes now live in a small apartment. Apartment house kitchens and dining rooms are being made smaller and more compact at the expense of the comfort and convenience of their users. This condition tends to decrease the use of gas for cooking, in that the preparation of a meal in an apartment house kitchen is not made easy by the construction of a convenient sized kitchen. Small dining rooms or no dining rooms at all do not make it desirable to eat at home, all of which tends to decrease cooking revenue.

There is a growing tendency for apartment house owners to install large oil-fired central heating and water heating systems in their apartment houses and when the families living in an apartment house pay their gas bills, they pay only for a small amount of gas used for cooking. In some of the newer apartments provision is not even being made for the use of gas in the building.

Restaurants: The restaurant man advertises a wonderfully cooked chicken dinner for a dollar a plate. Is this not an appeal to the housewife to forget her duties in the kitchen and go downtown for the evening meal? The restaurant and cafeteria business is on the increase and the tendency is toward the family type of dinner. Every time a family eats in a restaurant it means a loss in cooking revenue to us.

The Laundry: The laundryman is soliciting business from house to house. He comes to your door on Monday and offers to take away all the soiled clothes and return them at the end of the week as white as snow and the charge isn't so much. Isn't this an attractive offer to a housewife facing a day of scrubbing and rubbing?

Laundries do not usually obtain their hot water supply from gas fired systems. The home does.

The Baker: During 1925 the bakery business in the United States amounted to $1,250,000,000. The bakery business has shown a tremendous growth during the last ten years. There is very little bread at all baked in the home and people are being educated to eat bakery-made pastries. Even that "bakery taste" is being eliminated by scientific baking and the use of better materials. Large bakery mergers are bringing about increased efficiency, decreased cost, and better service to their patrons. What is happening to our domestic baking revenue? The use of gas in commercial bakeries is

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WHEN pipe is coated and buried; when equipment is erected and painted; the only barrier between the metal and the ravages of rust and corrosion is the protecting film of paint or compound.
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LONDON, 11 Southampton Row
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OAKLAND, CALIF., 5th & Madison Sts.
HONOLULU, T. H., W. A. Ramsay, Ltd.

gradually growing but so is the use of other fuels.

All of these factors are tending to decrease our domestic revenue. These businesses are keeping money away from our cash registers. Can't something be done to offset this decrease in the trend of the consumption per consumer?

This is what can be done to counteract these forces:

We must conduct an educational activity. Every gas company on the Pacific Coast should have a home service department.

Advertising should be conducted in newspapers, not advertising the sale of appliances so much but telling what the appliance will do—what delicious cakes can be baked in the modern gas range, etc.

We are neglecting the domestic science departments of our schools. Better equipment should be placed in these departments to give young women an opportunity to use modern gas equipment.

Cooking Schools should be conducted in conjunction with home service work, telling housewives how they might use their gas ranges more easily and to better advantage and make it a pleasure for them to work in their kitchens.

Think of the possibilities that are before us if, for example, we are able to get our consumers to use gas just ten minutes more per day for heating water or cooking breakfast food or any of the numerous other things that gas might be used for. If we get two million gas consumers to use gas ten minutes more per day our annual revenue would be increased by approximately $2,000,000.

THE UNSOLD APPLIANCE FIELD

In all of the surveys of equipment on consumers' premises which have been published, we find that most homes are sadly deficient in modern gas appliances. There is a vast unsold appliance field on this Coast.

In order to illustrate this condition, we have compiled Chart No. 2 from data obtained from surveys conducted by the various companies on the Coast. It was previously stated that average figures did not mean a great deal when it came to analyzing specific territories. In some sections we found a high percentage of our consumers using modern gas ranges and water heaters. In other sections there were dead spots in which the percentage of modern gas appliances was low.

The only proper way to determine what the condition is in your territory is to make a detailed house-to-house survey.

You will note that the chart indicates that fifteen per cent of our consumers use no gas for cooking purposes; twenty-five per cent use cookers, hot plates and combination stoves; and sixty per cent use cabinet type gas ranges. In other words, forty per cent of our consumers are either using no gas at all or are not using gas at its maximum efficiency for cooking purposes. This group represents a potential market for modern cabinet type gas ranges with oven heat controls, closed tops, and all of the later improvements.

If we could get one-half of our consumers who are now using other fuels for cooking purposes to use gas, we would increase our annual revenue approximately $4,000,000.

The chart also indicates that only twenty-five per cent of our consumers use automatic gas water heaters; sixty per cent are still using tank or combination boiler-type water heaters; and fifteen per cent use no gas for water heating, obtaining their supply of hot water from water backs in wood and coal stoves or water coils in solid fuel fur-

naces. Approximately fifteen per cent of our consumers use gas as a major source of heat in their homes.

There is still a vast potential market for automatic water heaters on the Pacific Coast. In the larger cities, automatic water heaters are being sold at the rate of about one out of twelve consumers per year. This includes sales to new homes. The rate of selling to our existing consumers now using tank heaters or other fuel for water heating is much smaller. In the smaller cities and towns the sale of automatic water heaters is progressing at a very slow rate.

Think of the possibilities of this unsold automatic water heater field. If we could double the number of automatic water heaters in use at the present time our annual revenue would be increased by approximately $15,000,000. Is this not a goal worth striving for?

It appears that the sale of gas appliances to new homes is being fairly well taken care of. The existing consumer is the one who is being neglected.

The Blue Star Plan will undoubtedly be an important factor in the appliance selling activity on the Coast in the next few years. If we can make our Blue Star program effective in improving the type of gas appliances which are being used by existing consumers as well as appliances sold to new homes, our problem will be partially solved.

Let us summarize the problems that confront us at the present time:

First: We have an unsatisfactory trend in gas consumption per consumer.

Second: There is a vast unsold appliance field.

Both of these factors tend to decrease the revenue per dollar invested in our business. What can be done to overcome this unsatisfactory condition?

First: The unsatisfactory trend in consumption per consumer can be overcome through the conduct of special home service educational activities.

Second: An aggressive appliance selling campaign is needed to sell the unsold appliance field.

A well balanced gas company sales program should include both of these activities. Merchandising activities should not be conducted at the expense of educational activities and in conducting purely educational activities the merchandising program should not be forgotten.

P. G. AND E. PLANS 16-INCH LINE

A sixteen-inch line, some eight miles in length and to follow the route of the New Bayshore Highway out of San Francisco as far as San Bruno, is planned among other construction activities for 1928, by the Pacific Gas and Electric Company. This line will augment the service supplied by the old eight inch line now in operation, and by swinging around further toward the shore of the bay will be strategically located to serve the increasing industrial demand of South San Francisco's manufacturers.

BUREAU OF MINES MEN RUN SO. CAL. FLOW TESTS

Two U. S. Bureau of Mines representatives, T. Johnson and William Burwall, arrived in Los Angeles on December 3, to spend two months on various Southern California gas properties. Tests are being run on pipe lines to check different flow formulae as they affect carrying capacity. Similar investigation has been conducted by the men in Oklahoma and Texas, and the eventual purpose of the work will be to recommend the most satisfactory formulae, or to develop and adopt new formulae.

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A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
Chaplin-Fulton Mfg. Co.
Fluor Construction Co.
Jackson Engr. & Equip. Co.
Jensen Instrument Co.
The E. A. Key Company
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Adjustable Plugs
Lattimer-Stevens Co.
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
W. P. Fuller & Co.
Hill, Hubbell & Co.

Analyzers
C. F Braun & Co.
A. R. Maas, Laboratories.
Smith-Emery Co.

Annealers (Bar, Blank, Strip)
Pacific Meter Works.

Anti-Fluctuators
Pacific Meter Works.

Apparatus, Experimental Gas
The Bartlett Hayward Co.
Pacific Meter Works.

Appraisals and Valuations
Charles R. Collins.
Smith-Emery Co.

Automobile Tires
Truck Tire Service Co.

Bags, Gas Main
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
Mueller Co.
Safety Gas Main Stopper Co.
Semet-Solvey Engr. Corpn.

Barometers
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blast Gates
Semet-Solvay Engr. Corpn.

Blocks and Tiles, Fire Clay
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.

Boiler—Brickwork
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
C. B. Babcock Co.
Baker Iron Works.

Boiler Settings, Pipe and Boiler Insulation
Pioneer Paper Company.
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.
The Bartlett Hayward Co.

Boilers, Water Tube
Baker Iron Works.
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Boxes
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Brass (rods, sheets, tubes, wire)
Mueller Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Brick, Firebrick—Installation
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B Babcock Co.
The Bartlett Hayward Co.
General Gas Light Co.
Johnson Gas Appliance Co.
Lee B. Mettler.
Payne Furnace & Supply Co.
Rotary Manufacturing Co.
Standard Gas Equipment Corp.

Burners—Oil
Rotary Manufacturing Co.

By-product Recovery Apparatus
The Bartlett Hayward Co.
Oliver Continuous Filter Co.
Semet-Solvay Engr. Corpn.

Calorimeter Accessories
Pacific Meter Works.

Calorimeters
Pacific Meter Works.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
Semet-Solvay Engr. Corpn.
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
Semet-Solvey Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Cement
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Cement—Plastic
Pioneer Paper Company.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Checker Brick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
Pacific Meter Works.
Stauffer Chemical Co.
Westcott & Greis, Inc.

Chemists, Analytical
A. R. Maas, Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
Semet-Solvay Engr. Corpn.
The Bartlett Hayward Co.

Coal Tar Products and Chemicals
W. P. Fuller & Co.
A. R. Maas, Laboratories.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Lattimer-Stevens Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Compressors, Air
The C. & G. Cooper Co.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
Baker Iron Works.
The Bartlett Hayward Co.
C. F. Braun & Co.
Ingersoll-Rand Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Condenser Boxes
Baker Iron Works.

Condenser Tubes
Semet-Solvay Engr. Corpn.

Controllers
Jensen Instrument Co.
The Foxboro Co., Inc.

Controls, Air and Steam
Jensen Instrument Co.
The Bartlett Hayward Co.
C. F. Braun & Co.
The Foxboro Co., Inc.

Cooling Systems
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Cooling Towers
C. F. Braun & Co.
J. A. Campbell
Fluor Construction Co.
J. B. Gill Corporation.
Jackson Engr. & Equip. Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.

Counters, Revolution
Jensen Instrument Co.

Couplings
Pittsburgh Equitable Meter Co
The Bartlett Hayward Co.

Coverings (Tank, Boiler, Cold and Steam Pipe)
Pioneer Paper Company.

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressor
The C. & G. Cooper Co.
Semet-Solvay Engr. Corpn.

Dephlegmaters
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Displacement System, Tar
Semet-Solvey Engr. Corpn.

Door, Clean-out
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

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Payne Furnace & Supply Co.

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Baker Iron Works.

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Charles R. Collins.
J. B. Gill Corporation.
The Bartlett Hayward Co.
A. R. Maas, Laboratories.
Smith-Emery Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
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The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Oil
The C. & G. Cooper Co.
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Engines, Steam
Ingersoll-Rand Co.

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Exchangers, Heat
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Western Pipe & Steel Co.

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Mueller Co.

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Pioneer Paper Company.

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Fire Brick Contractors
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Stockton Fire Brick Co.

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Southwestern Engineering Corp.

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Semet-Solvay Engr. Corpn.

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Westcott & Greis, Inc.

Flooring—Industrial
Pioneer Paper Company.

Forgings
Baker Iron Works.
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

Furnaces, Floor
Magic Way Company
Payne Furnace & Supply Co.
Pacific Gas Heating Co.

Furnaces, Heating
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Magic Way Company.

Furnaces, Lead Melting
C. B. Babcock Co.
The Estate Stove Co.
Johnson Gas Appliance Co.
Mueller Co.
Payne Furnace & Supply Co.

Gas Analysis Apparatus
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.

Gas Masks
Safety Gas Main Stopper Co.

Gas Main Tapping & Drilling Machines
Mueller Co.

Gaskets
The E. A. Key Company
Pittsburgh Equitable Meter Co
Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.

Gasket Compound
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E. A. Key Co.

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Pacific Meter Works.
Semet-Solvay Engr. Corpn.

Gas Pipe Line Construction
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Gauges
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

145 MILES OF 279-MILE DIXIE LINE LAID

Dixie Gulf Pipe Line Company has completed 145 miles of the 279-mile 22-inch line from the Waskom field on the Texas-Louisiana line to Houston. Five crews are now working to bring the line to a hurried completion, including one crew on the 16-inch branch to Houston from Livingston, and one on the 18-inch branch from Livingston to Port Arthur. The 145 miles of line was laid in less than two months. The original plans were to have the line complete by January 1, but it is now expected to be incomplete until early spring, 1928.

PICTORIAL SECTION FEATURES DENVER UTILITY

The Rocky Mountain News, Denver, Colo., for Sunday, November 13, devoted a large portion of its rotograveur pictorial section to commemorate the 58th anniversary of the Public Service Company of Colorado. An interesting coincidence played up by the paper was the fact that the company's anniversary and the birth anniversary of Clare N. Stannard, the utility's vice president and general manager, fall on the same date. Pictures of company properties and personnel featured the rotograveur section.

MOODY-SEAGRAVES ACREAGE IN MISSISSIPPI

Mississippi is destined to come into the list of large gas producing states, according to present plans of the Moody-Seagraves interests to enter the state on a large scale for development of acreage. This company has taken a half interest in 94,000 acres scattered through Itawamba, Lee, Union, Tippah and Prestiss counties, all of which land lies to the northwest of the Amory discovery well in section 7-13-17, Monroe County. The company now has a well drilling around 1500 feet in section 16-9-7. Contract on this well calls for finishing at a required depth of 2850 feet.

TIE-IN LINE COMPLETED BY P. G. AND E.

An important tie-in line, approximately eight miles of welded steel eight-inch pipe, has just been completed between the towns of Mayfield and Redwood City on the Pacific Gas and Electric Company's system. Turning the gas into this line broke the so-called bottle neck that had existed in the distribution system down the Peninsula south of San Francisco since the city line was tied in to the San Jose system some time ago.

Heretofore only a four-inch main had served to connect the two towns of Mayfield and Redwood City, but with the old line and the new line both in operation, it is anticipated that the peak load as far south as San Jose can now be augmented by gas sent out from the Potrero San Francisco plant in off hours and stored in the southern holders.

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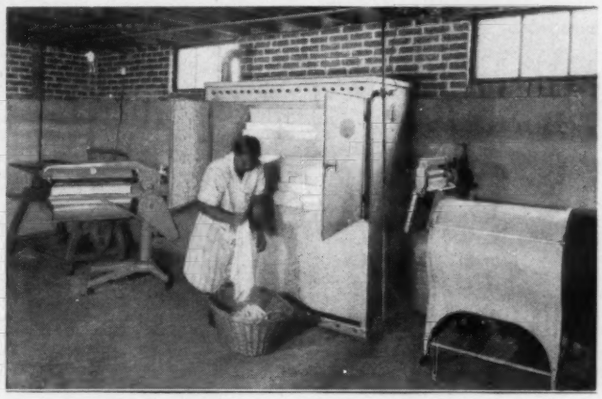

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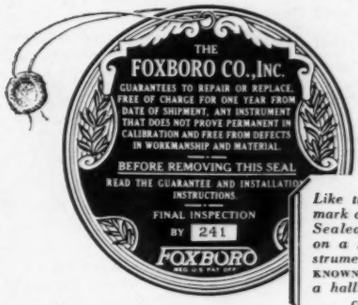
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Advertisers' Index

American Seamless Tube Co. 67
The Arco Company 63

C. B. Babcock Co. 63
The Bartlett Hayward Co. 71
C. F. Braun & Co. 3

J. A. Campbell 55
Chaplin-Fulton Mfg. Co. 61
Cleveland Trencher Co. 58
Connelly Iron Sponge Co. 58
C. & G. Cooper Co. 2
Copper & Brass Research Assn. ..... —

The Estate Stove Co. ..... First Cover
Everlasting Paint & Sales Co. 5

The Foxboro Co., Inc. 69
W. P. Fuller Co. ..... —

General Gas Light Co. 11
Gladding, McBean & Co. 64

Hill Hubbell & Co. 9

Ingersoll-Rand Company ..... —
Imperial Gas Co. 50

Jackson Engineering & Equipment Co. 57
Johnson Gas Appliance Co. 60

E. A. Key Company 62

The W. E. Lamneck Co. 69
Lattimer-Stevens Co. ..... Fourth Cover

Arthur R. Maas 60
Magic Way Company 62
Merco Nordstrom Valve Co. ..... Second Cover
Lee B. Mettler Co. 70
Chas. C. Moore & Co. 53
Mueller Co. ..... Third Cover

New Way Mfg. Co. 54

Oliver Continuous Filter Co. 64

Pacific Gas Radiator Co. ..... —
Pacific Gas and Electric Co. 10
Pacific Meter Works 6
Payne Furnace & Supply Co., Inc. 53
Pioneer Paper Co. 59
Pittsburgh Equitable Meter Co. 7

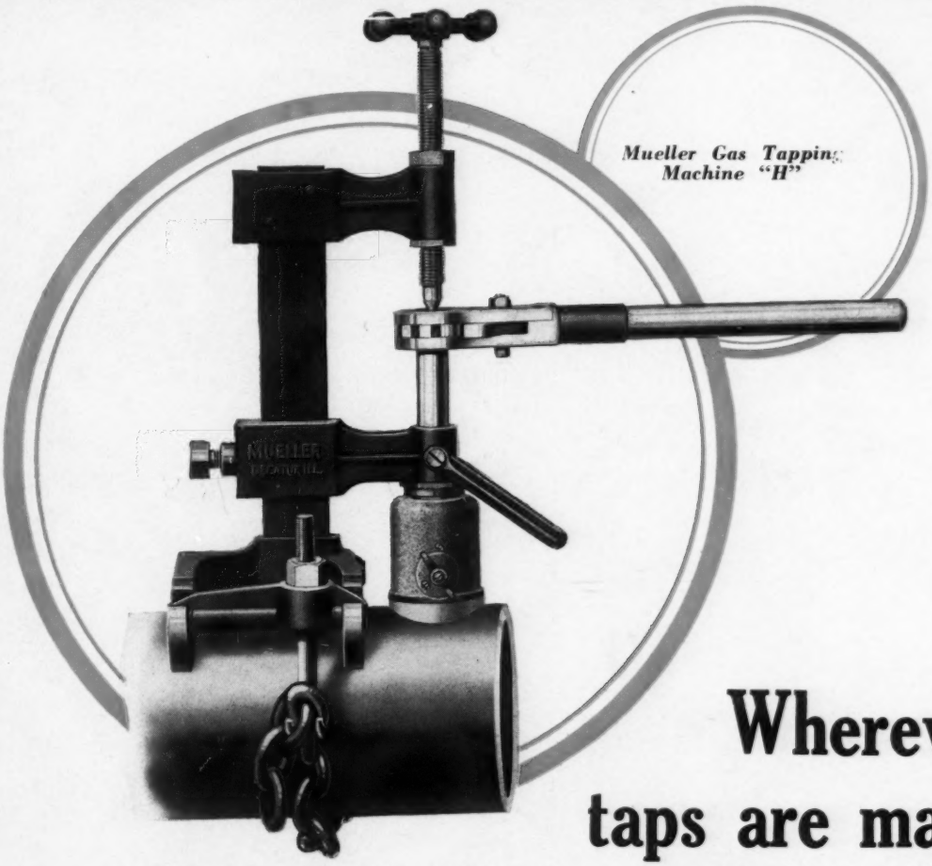
Reliance Manufacturing Co. 65
Reynolds Gas Regulator Co. 55
Robinson Orifice Fitting Co. 56
George D. Roper Corporation ..... —
Rotary Manufacturing Co. 61

Safety Gas Main Stopper Co. 8
Semet-Solvay Engr. Corp. 16
South Chester Tube Co. 60
Southwestern Engineering Corp. 1
Sprague Meter Company 71
Standard Gas Equipment Co. 13
Stauffer Chemical Co. 70
Stockton Fire Brick Co. 58
W. W. Strickler & Bros. 57
Superbo Mfg. Co. 52

Tappan Stove Company ..... —
J. T. Thorpe & Son 67
Truck Tire Service Co. 51

U. S. Cast Iron Pipe and Foundry Co. ..... —

Welsbach Company 12
Westcott & Greis, Inc. 4
Western Pipe & Steel Co. 59
The Wilcolator Co. 14



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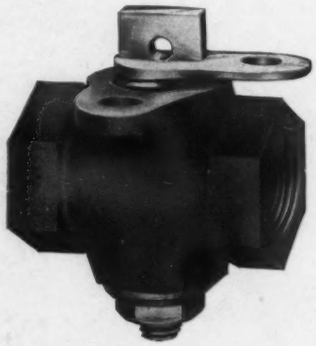

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